RAILROAD GAZETTE

FRIDAY, APRIL 13, 1894.

CONTENTS.

Contributions.

The Mexican Central Smoke Box.

PITTSBURGH, April 10, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the description of the Mexican Central Railroad standard smoke box, illustrated in your issue of April 6, I am credited with having designed that construction. While I should be much pleased if this statement was correct, as the arrangement is entirely in accord with the views which I have always advocated on the subject of locomotive front ends, I feel that in justice to Mr. F. W. Johnstone, Superintendent of Motive Power, Mexican Central Railroad, I should say that the credit of the design is due to him, and not to me.

Mr. Johnstone is one who follows the injunction to "prove all things; hold fast that which is good." Having tried the extended smoke box, and found that it was *not* good, the construction referred to followed, as a simple and practical embodiment of such features of advantage as exist in the present extension system, i. e., the open stack, netting in smoke box, and deflecting plate, without the useless and detrimental ones of the extension itself.

I should be glad to know that my efforts to evidence the error in principle, and objections in practice, of the extended smoke box, had any influence in leading up to this design, but cannot claim that as a design I am in any way entitled to it. J. SNOWDEN BELL.

Distribution of Weights on Driving Wheels.

KINGSTON, Ont., March 22, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your article on "The Distribution of Weight on Driving Wheels" in the *Railroad Gazette* of March 9, page 179, you state "divide the total weight above the driving springs," etc. Am I correct in assuming that the total weight referred to is the weight above the driving springs *plus the weight on the truck bearing*?

I have before me the drawing of a 10-wheel locomotive in which all the driving springs on each side of the engine are equalized together, but the front driving springs have a less number of plates than those of the main and hind driving springs. Is not this incorrect? Will not the load on the front springs be equal to that on the main and hind springs?

Is there any simple method of finding the longitudinal position of the center of gravity of that part of the locomotive which rests on the driving springs and the truck, when the weight on the truck and on the resultant centers of equalizer system is not known?

LOCOMOTIVE.

[Our correspondent is correct in assuming that "the weight above the driving springs" is intended to include the weight above the truck bearing. In the case of the ten-wheel locomotive he describes, the springs being equalized together, the loads on the springs will be practically equal and there is no apparent reason for making one spring of less carrying capacity than the other. The only effect of using less leaves in the front spring is to increase the flexibility of that spring, but as there is no need for a different flexibility of the springs over the front drivers, it would appear that the more flexible springs in this case were selected because of some wrong theory of spring action. We do not say that a flexible spring does not have a different action from a stiff spring, but on the same locomotive there is no practical value in making one spring less flexible than another, when all are equalized together. The effect in this case of using a more flexible spring on the front drivers is to permit those drivers to rise or fall more with the same variation in loading, and in weight on track, than the other drivers with stiffer springs; also at high speeds the lifting effect of the counterbalances is more pronounced when the springs are flexible than when the springs are stiff. To find the center of gravity of that part of the engine above the driving springs when the weights on the truck and on the equalizer system are not known, one must calculate the weights of the most important parts such as the boiler filled with water, fuel, grates, etc., and the cab foot plates, frame, cylinders, cross heads, guides, pilot, etc. The small parts can be omitted from the calculation, as their weight will not materially affect the location of the center of gravity. The approximate center of gravity of each part except the boiler and the frame can be determined by simple inspection. Assume a vertical line just ahead of the firebox, as that is the point most easily described as being near the center of gravity. This is the temporary line useful only for the purpose of calculation. Divide the boiler and frame into short sections, estimate the weights of the sections and multiply each weight by the distance from the assumed line to the approximate center of gravity of the section. Perform this multiplication for all the different parts; and the products so found are what is called the "moment" of the parts, which is a term used to express the tendency of these parts to rotate about the assumed line if the locomotive was supported on a bearing at that line. Add all the moments on the right side of the line together and likewise all the moments on the left side. Substract one from the other and, supposing the moments to be greater on the right side, the difference divided by the total weight of all the parts considered is approximately the distance from the assumed line toward the right to the center of gravity. To further correct this and to get a more accurate result, substract this distance from all the distances on the right side and add it to all the distances on the left side, multiply by the weights as before and see if the products are equal; if not, again get the difference and proceed as before to get a closer approximation. For all purposes of equalization of weight on drivers only the more important parts need to be considered.—EDITOR RAILROAD GAZETTE.]

Consolidation of the M. C. B. and M. M. Associations.

The question of the advisability of consolidating the Master Car Builders' and Master Mechanics' associations having been again raised by some members of both of those associations we have addressed a few letters to officers of some of the most important railroad systems in the country, most of whom are active members of one or both of the associations. We give below some notes from the answers received, the gentlemen writing representing about 40,000 miles of railroad.

A Superintendent of Motive Power.—For the best interests of both associations and of the railroad companies represented a consolidation would be desirable. It would save much time at the conventions, and would enable all interested in all classes of rolling stock to attend the meetings and hear and take part in the discussions. Very few members now attend both conventions, for that would take more time than they can spare. The rolling stock is rapidly being concentrated under one head, and it seems that the tendency in this is toward consolidation. I speak knowingly when I say that many of the higher officers of the railroads are in favor of a united rolling stock association. The associations have accomplished wonders of good in their spheres, and the conditions in the past might have justified their separation, but consolidation now is for the interest of all, and I am of the opinion that the associations will unite before long.

A General Superintendent of Motive Power.—I have not made up my mind whether consolidation would be advantageous. For some reasons it would be a good thing, the chief one being that master mechanics have to take charge of car equipment on nearly every road, to build and repair it and to keep accounts. On the other hand, the master car builders would pay but little attention to discussions on other subjects than that of car building, and I do not believe that they will be very active in a combined association. Possibly the best plan would be to consolidate and divide the association into two sections, as is done with most scientific bodies, which would give unity of purpose where necessary, and also diversity. The combination of the car and locomotive departments into one department of a railroad is the proper way, and the most economical, to handle the matter. My own road has long been run on a separate system and I know from experience that it is not as economical as it should be.

A General Manager.—This is a question that had better be left to the members of the associations. Yearly meetings of the master car builders are necessary. So frequent meetings of the master mechanics do not seem to be necessary, because in the one case the equipment is constantly interchanged and in the other it never is. For car equipment varying conditions require an annual revision of the rules. The handling, maintenance and repair of equipment of the foreign lines are facilitated and the cost of work cheapened by having uniform standards; none of these things apply to the motive power, which remains on its own rule. Still it is a good thing for the representatives of the various mechanical departments to get together at least once a year. It seems to me that the best plan is for the associations to remain distinct, to meet once a year at the same place, giving three days to one association and three days of the same week to the other, and what is still more advisable, to confine the meetings to business. In the past they have partaken too much of play and too little of work.

A Superintendent of Motive Power.—The associations are two distinct bodies for the discussion of two distinct and independent subjects. It seems to me hardly proper to consolidate them into one. By keeping them separate, fuller discussion is brought out and better results obtained.

A General Manager.—If the members desire to consolidate the two associations, we should not object. The present arrangement of having the sessions in one place and one week probably secures any advantage that would be gained by consolidation. The saving in salaries and printing would probably not be very important.

A General Manager.—I cannot express an opinion on the matter of consolidation, which I think should be left to the members, but the "supplyman" feature ought to be eliminated from the conventions. Probably the work could be covered in two sessions of two days each, leaving two days in the same week for social intercourse.

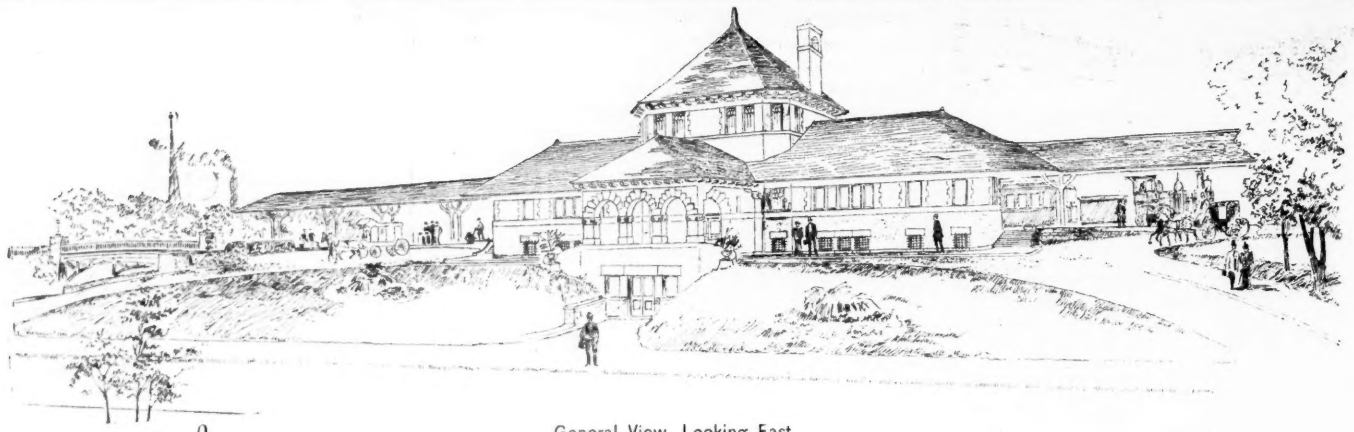
A Superintendent of Machinery.—I can see no benefit from consolidation and prefer that the associations remain distinct. They work together now and I do not know of any friction. I believe the members of the associations are fully competent to decide matters of this kind.

A Superintendent of Motive Power.—I am not in favor of consolidation. I am afraid that the result would be a good deal like that in the Superintendents' Association, which sends around many circulars and apparently does nothing. I am more inclined toward disintegration, following out the movement now begun for a traveling engineers' association, car painters' association, boilermakers' association, etc. I should have no objection to an association of superintendents of motive power, which might be a good thing, but I do not believe the superintendents of motive power are the proper persons to discuss in detail the various questions which should come before the Master Car Builders' and Master Mechanics' associations. It might be well to form a railroad mechanical association with sections devoted to special work, such sections being composed of specialists, as boilermakers, blacksmiths, car painters, car builders, practical master mechanics and shop foremen. I rather think that from such an association we could get better results than we have ever got in the past and it could be made a body with a very important standing.

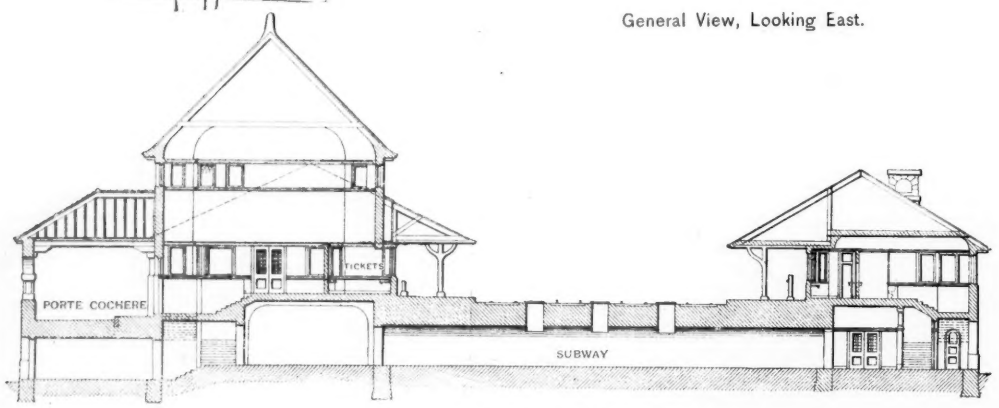
A General Superintendent of Motive Power.—As a business man and on general principles, I think it would be better to consolidate the associations, but not to change the character of work that either one is doing. Each has a special function of its own, the functions of the Master Car Builders' Association being common to all the roads, that of the Master Mechanics being local. Perhaps the Master Mechanics' Association might be merged into the M. C. B. with a new name, if you please.

A General Superintendent.—I am not in favor of consolidation in any sense of the word. The old M. C. B. Association has done more to facilitate and economize operation than any other association in the country. It would not be possible for the railroads to do their business but for the work that this association has done. The scope of the Master Mechanics' Association could not be of like importance to the railroads, for there is no interchange of locomotives. In a consolidated association the master car builders would actually lose time rather than save it by being obliged to listen to discussions of subjects in which they are not interested.

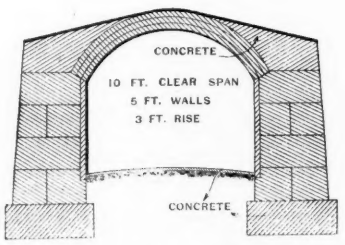
A General Superintendent of Motive Power.—At one time I had no doubt of the advisability of consolidation, but having become more familiar with the work of both associations I doubt whether such a movement would be altogether wise. Master mechanics have given little attention to car work, either as to design or methods of construction and repair. These items are a source of enormous expense and should be handled by men who understand the subject thoroughly, so I doubt very much if the interests of the railroad companies would be best served by a consolidation which would tend to exclude from participation in the work of the association the men who are best fitted to give intelligent advice in shop management and economical methods of constructing and repairing cars. If a consolidation could be



General View, Looking East.



Transverse Section, Looking North.



Subway Connecting the Two Station Buildings.

made that would not exclude this class of men from membership, little objection could perhaps be found to the consolidation, but to my mind what is wanted most of all is some hard study on the part of the men who nominally control both the locomotive and car department, to familiarize themselves with the details of the car department especially.

The Abolition of Grade Crossings in Brockton, Mass.

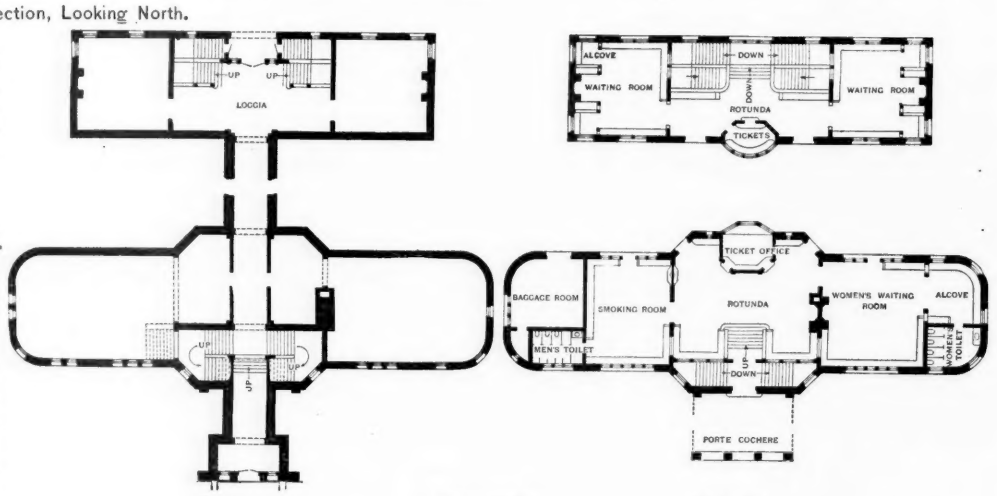
Brockton is a city of about 39,000 inhabitants, on the main line of the Central Division of the Old Colony Railroad. The growth of the city has been one of the largest among Massachusetts towns: a town in 1821 a city in 1881, and increasing from 13,000 inhabitants in 1880 to 30,000 at the present time, as above stated. Within the city limits are three stations, with freight yards and houses, Montello, Brockton and Campello. Like most manufacturing towns, the growth has been along the line of the railroad; gradually streets have been laid out across its tracks, all at grade, and private ways and farm crossings have become public ways, so that at the present time there are 11 crossings at grade over which the public have rights. The freightyard at Brockton is at present in the center of the city, and freight cars have to be shifted across the principal streets.

When the grade crossing law was passed, in 1890, Brockton was the first city to avail herself of it, and immediately petitioned for a commission to be appointed in accordance with the provisions of the act, and also began negotiations with the railroad officials regarding the abolition of all the grade crossings within the city limits. The act of 1890 provided only for public streets, and as many of the most important streets in Brockton had never been accepted as public ways, a special act was passed in 1892 permitting the Commission to consider private ways. Various schemes were presented and discussed, and finally an agreement was made between the city and the railroad in June last to raise the grade of the railroad through the center of the city 12 ft. and to depress it through Campello about 8 ft.

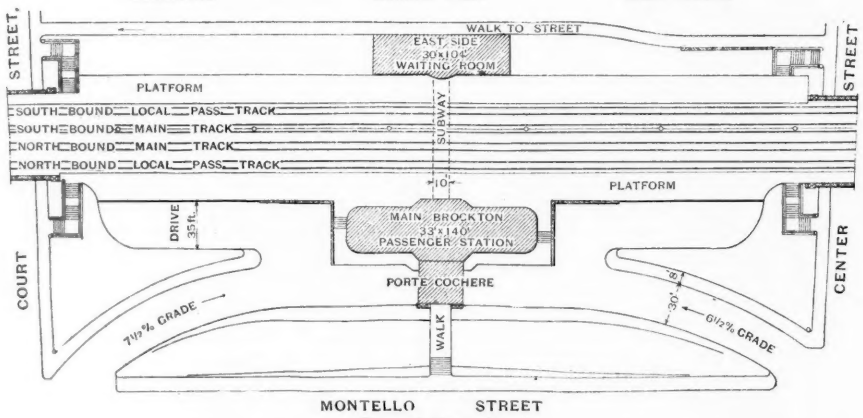
One of the worst complications was the question of freight facilities at Brockton. The railroad company had a short time before bought a piece of land of about 15 acres for a freightyard. This land is some 15 ft. below the grade of the tracks as they now are, and to get down into this yard from a grade 12 ft. higher necessitated raising the whole yard some 10 ft. and building switching tracks across the main streets, supported by heavy retaining walls.

While the affairs incident to the change of management from the Old Colony to the New York, New Haven & Hartford were being straightened out, the plans as above stated were changed, and entrance to this freightyard, to which had been added some 20 acres more of land, was made from the northerly side, at a great benefit to the yard, and great saving of expense in extra tracks and walls through the city. These plans now adopted, call for the following changes and work:

The grade of the railroad is to be raised for a distance of 9,000 ft., the maximum raise being 15 ft., and lowered for a distance of 5,100 ft., the maximum being 12 ft. Four tracks are to be built the length of this change of grade; new passenger stations are to be built at Brockton and Campello, and a new waiting station at Montello, all from plans of Bradford L. Gilbert, of New York City, who has made the plans for most of the recent stations on the Old Colony road.



Basement. General Plan. Main Floors.



Plan of Grounds.

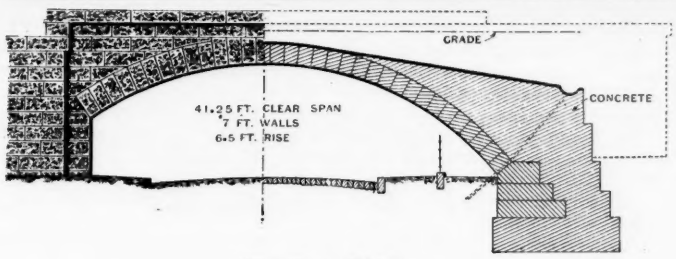
PASSENGER STATION AT BROCKTON, MASS.

New York, New Haven & Hartford Railroad, Old Colony System.

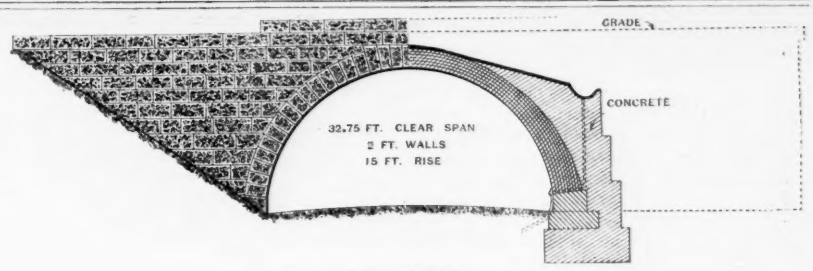
All stations will be double, consisting of a main station on the westerly side of the tracks (trains run toward Boston on the west track), with a waiting station on the easterly side. Subways under the tracks connect the two. The Brockton main station will be 33 ft. × 140 ft., and the waiting station 30 ft. × 104 ft. This main station will be on the grade of the tracks, and the approaches will be graded to it, so that carriages can drive up to the platforms. A walk leads from the main street to the subway, which continues through under the station and tracks, on a level, to the waiting station on the easterly side. All the stations are to be built of granite, with red sandstone trimmings.

New freight yards and houses are to be built at Montello, Brockton and Campello. The main yard will be at Brockton, and will eventually cover about 40 acres, and have a capacity of over 1,000 cars. This yard is reached by a switchback from the main line, covering a descent of 26 ft. with a maximum grade of 63 ft. per mile and a curve of 8 deg. (717 ft. radius). Ample track room has been provided on the grade of the main line for all switching, so that through freight trains do not enter the main yard. A freighthouse 50 ft. × 500 ft. and a coal shed 80 ft. × 400 ft. will be built for the present accommodation of the traffic, and numerous streets and approaches have been laid out, so as to afford access to the freighthouse and storage tracks from all sides. The Montello and Campello yards are much smaller, but land enough has been provided for future growth.

Each of these three freightyards has a water-course through it, and, to provide for this, expensive culverts will be built: in the Montello yard an 8-ft. arch with three walls 600 ft. long; at Brockton, a 16 ft. arch with 6-ft. walls, 150 ft. long; and at Campello, a double 16-ft. arch, with 5-ft. walls, 200 ft. long. These culverts will be built of rubble masonry and concrete for foundations and side walls, with brick arches, and are estimated to cost $45,000. At Campello, which is the terminus of a series of local trains, the present terminal grounds, with engine-house, turntable and coal sheds,

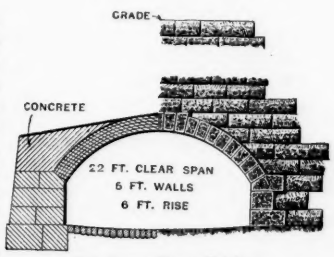


Eliot Street Bridge.



Crescent Street Bridge.

have been taken for the new passenger station grounds, and a new terminal will be provided about 1,500 ft. south of the present one. For this terminal a tract of land of about seven acres will be taken, admirably fitted for such a purpose, being dry, gravelly soil, which can be easily drained. On this will be built 70-ft. brick engine-house with four stalls, a 60-ft. iron turntable and a coaling trestle, with all necessary tracks, sidings and connections.



Salisbury River Bridge.

This change of grade, as decided upon, will require the construction of seven arches of masonry over streets, two arches over streams, four subways for pedestrians, three of which are between stations, as before described, two plate-girder bridges, also over streets, and eight highway bridges over the railroad.

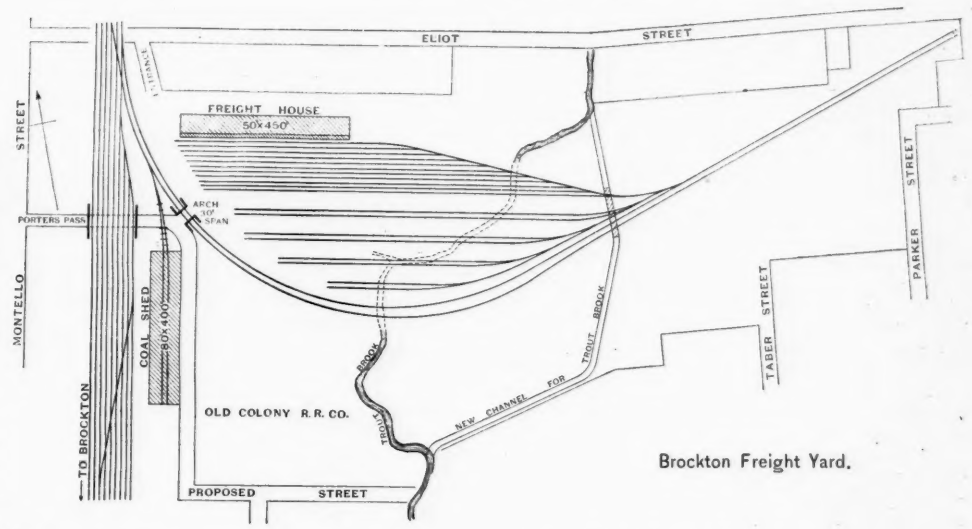
Three of the street arches have a span of 50 ft., with rises of 7, 8 and 9½ ft., and two with spans of 41.25 ft., with rises of 6½ and 7 ft.; the other two arches are 30 ft. spans, practically semicircular. All arches, except the two latter, have walls 7 ft. high above the sidewalk, at the ends of the arches. To overcome the difficulty and expense of these flat arches, the arch sheeting with the exception of about 3 ft. at each end of the arch, is continued down to skewbacks almost at the street level, so changing the ratio of span to rise in the worst case from 7 to 1 down to about 5 to 1. This changes the angle of the resultant of the combined loads so as to bring it within the middle third of the foundations, designed to carry a load of 3 tons per square foot, which is the limit allowed for these structures, the soil being good, firm gravel, and the masonry foundation 4 ft. of concrete. The faces of these arches will show an arch springing from a skewback, 7 ft. above the street grade and on the street line, but this skewback and wall supporting it will be only 3 or 4 ft. thick, and then the arch will drop back as stated. It is proposed to build an ornamental iron fence on the line of the walls, *i.e.*, the street line, on a heavy curbstone, to keep the public within the street limits.

The backing of all the arches will be of concrete; and to make this watertight it is proposed to cover this backing with three thicknesses of heavy roofing paper, each thoroughly lapped and tarred over, with an inch of asphalt over the paper. The water will be collected in gutters to be built in the edges of the concrete backing, and from them conducted through the masonry by pipes into the street drains. Only two of the five main arches are square, the balance being at angles varying from 83 deg. to 57 deg. It is proposed to make the ring stones of these arches of granite, in courses parallel to the axis of the arch, with the faces cut on the skew required, with possibly the exception of the worst angle, which may be built with a true skew face with arch inside of brick.

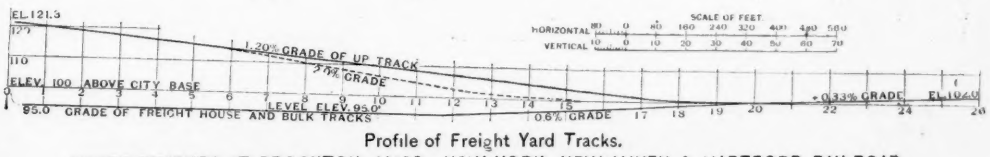
Plate girder bridges will be built to span Ashland and Lawrence streets, the former requiring girders 57.5 ft. long, and the latter girders 47.5 ft. in length. These bridges will be built of wrought iron, with floor beams, supporting track stringers, which are spaced 6 ft. apart on centers. On these stringers will be the floor, of 8×8 in. ties, 13 ft. long, spaced 4 in. apart, and guard rails of 8×8 in. timber, notched to 6 in. outside of track, and rail guards inside of track. These bridges are to have a plank floor on the ties, to protect the travel in the street below.

All masonry supporting track bridges is to be of first-class Ashlar. Highway bridges will be riveted lattice trusses, with suspended floor beams between tracks. Trusses will be about 7¾ ft. in height for 70-ft. spans, or generally about one-ninth of span, and will carry a sidewalk on both sides of the roadway. The floor of the roadway is of double planking, 3-in. hard pine underneath, on 4×14 in. hard pine floor stringers, and 2-in. spruce planking on top, forming surface of roadway. Bridges are designed to carry a load of 100 lbs. per square foot, or two 24-ton electric cars, coupled, or side by side on two tracks. The masonry supporting highway bridges will be of first-class rubble, laid solid in cement mortar.

For a large part of the distance of the change of the grade, land has been taken sufficient for slopes for the new grade; but through the center of the city retaining walls will be built on the line of the present right of way, where outside land could not be obtained.



Brockton Freight Yard.



Profile of Freight Yard Tracks.

IMPROVEMENTS AT BROCKTON, MASS., NEW YORK, NEW HAVEN & HARTFORD RAILROAD.

These widths of land, either now owned by the railroad or to be acquired by the decree of the Commissioners, will admit of building two tracks on the new grade complete, with bridges, arches and stations, and then turning traffic into them and finishing the other half. All new construction is for at least four tracks, which the decree provides shall be of "heavy steel rails, properly tied and ballasted, and equipped with all necessary frogs, switches and signals." Tracks are all 13 ft. apart on centers.

Many changes are to be made in the grades of the streets, every one of those crossed being changed, to get over or under the railroad, and these changes of grades in many cases will involve other streets adjacent to the grade crossing abolished. These changes are in most cases so much as to necessitate the reconstruction of the water and gas pipes and sewers, and in many cases the construction of new drains for the disposal of water, which will be changed in its flow by the changes of grade.

All these streets are to be either paved with granite blocks, or to have a macadam paving 8 in. thick, with edge stones, crossing, etc. The decree of the Commissioners requiring this work to be done, "for the security and convenience of the public," was signed on March 8, and it is expected that work will be immediately begun, and finished within three years. The estimated cost is $1,500,000, of which amount the railroad pays 65 per cent., the state 25 per cent. and the city of Brockton 10 per cent. The Commissioners, appointed by the Court, under whose direction the plans for this work have been made, were Hon. B. W. Harris, of Bridgewater: Charles B. Barnes, of Boston, and H. C. Southworth, C. E., of Stoughton. The engineering has been done by F. H. Snow, City Engineer, for the city of Brockton; plans of stations have been from the office of Bradford L. Gilbert, of New York; and the Old Colony work by J. W. Rollins, Jr., Resident Engineer.

The Extension of the "East Coast Line," to Lake Worth Fla.

The new railroad construction work in the United States was for many years of the very highest importance in the financial and industrial history of the country. The decrease since the boom year of 1887 has been so marked that railroad building is no longer of much consequence to general business or to more than a very few particular industries. The new mileage which may be added in any one year to the railroads in operation is so small a percentage of the existing lines that it is of very little significance even to railroad history. Interest in railroad construction has also been lessened by the fact that so small an aggregate of the mileage that is built consists of long or important lines. The parallel building of extensions by the lines west of the Missouri River early in the eighties has not been repeated in recent construction work.

Still, some noticeable lines have been completed in the last few years. The longest line built in the last year has been the extension of the Jacksonville, St. Augustine & Indian River road to Lake Worth, Fla. It is the most important railroad undertaking in Florida in many years, and the enterprise was brought to a successful finish on March 20, when the tracklaying was completed. The following interesting description of the line was written for us by Mr. Charles O. Haines, who has been Chief Engineer of the company since the extension was begun and has had direct charge of the construction. The railroad is owned chiefly by Mr. H M. Flagler, who built the great hotels at St. Augustine and who has just finished another fine hotel at Lake Worth.

The terminus of the road was for some years at Daytona, about 112 miles south of Jacksonville. The total length of the extension from Daytona, to West Palm Beach at Lake Worth, is 189 miles. Work was commenced in May, 1892, and the first section, 65 miles long to Rockledge on the Indian River, was opened for business in January, 1893. The head of the Indian River is reached 135 miles south of Jacksonville, and from that point to Titusville, 14 miles, the road extends through an open prairie lying between the river and the Turnbull Hammock. It is level for this distance, the grade being eight ft. above high water, and is from 100 to 800 ft. from the river. For some distance after leaving Titusville only occasional glimpses are had of the river, the line being located on the ridge dividing this great lagoon from its prehistoric predecessor, now a chain of fresh water ponds, drained by overflow into the St. Johns and into Indian River. Nine miles north of Rockledge, the Indian River orange region is reached. Here considerable ingenuity was needed to meet the views of the orange groves as to the proper location, and at the same time keep within our maximum gradient and curvature. The passenger department too, with desires for a scenic line stimulated by the 14 miles of river view above Titusville, had to be taken into consideration.

Work on the line from Rocklege to West Palm Beach was begun in February, 1893, and the first section to Eau Gallie, 15 miles south of Rockledge, was completed in June. At Eau Gallie travel for the lower river and Lake Worth was transferred to steamers, until the road was opened to Fort Pierce in January, 1894.

In May, 1893, work was also commenced on the Lake Worth Division, between Jupiter and West Palm Beach. Eighty miles of difficult river navigation separated this part of the line from our base of supplies at Eau Gallie; all track material and supplies for the men having to be taken to Jupiter by boat. This with unusually wet weather in the spring was the source of much delay on this division. The entire line, excepting the bridge across the St. Lucie River, was practically completed by the end of last February, but work on that structure had scarcely commenced. As it was the desire of the President, Mr. H. M. Flagler, to put on a through train on March 20, our forces were concentrated at this point, and in three weeks a trestle 3,400 ft. long, 1,300 ft. of it in water 20 ft. deep, was completed, the pivot pier built and the drawbridge erected. The first through train to

pass over it was the special of vestibuled Pullman cars with the members of the General Passenger Agents Association, whose convention this year was held at the new Hotel Royal Poinciana, Palm Beach.

The road just completed has been substantially built, the bridging having received special care. Piles treated with dead oil of coal tar are used in all trestling in salt water, and all wood work is treated with creosote or some other wood preservative. The most important bridges are those across Rose Bay, Spruce, EauGallie and Crane creeks and the San Sebastian, St. Lucie and Jupiter rivers. Each of these is over 1,000 ft. and in the case of the two last named, steel drawbridges have been put in. As fast as each section was finished, with track in condition for schedule passenger trains at 30 miles an hour, it was turned over to the operating department; all sidings, stations, water tanks and road crossings also being first completed.

We have met with few physical difficulties. Boulders and ledges of Coquina rock were found in some of the cuts, but excavation was generally in sand. Our location, as a rule, has been made on the ridges to the west of the chain of salt lagoons that borders the East Coast of Florida, and the road is rarely more than a quarter of a mile from one of them. The work is generally light, our heaviest cuttings not exceeding 24 ft. and fills 18 ft. Wharves have been built at New Symrna on the Halifax, at Cocoa, Eau Gallie and Fort Pierce on the Indian River, at Alicia and Stuart on the St. Lucie, at West Jupiter on the Jupiter River and at West Palm Beach on Lake Worth. Palmetto, which is never attacked by the teredo, has been used for piling in these structures except those in fresh water.

The climate during the summer was pleasant, the trade winds serving to moderate the heat, and not a case of sunstroke or malaria occurred during the progress of the work. This being a comparatively unsettled country all the labor was necessarily imported, Italians being brought from New York, Scandinavians from Chicago, and negroes from the more thickly settled Southern States. The latter, as is usually the case in the South, proved to be the most efficient. Many of the Scandinavians have bought or homesteaded land and gone into vegetable or pineapple culture. Among the attractions on the line are the pineapple fields through which the road runs from Fort Pierce to the St. Lucie River. Here land is so valuable that we experienced greater difficulty in making our location and securing right of way than was the case in the orange growing district. The pineapples are planted in many places up to the track, and for miles stretch in almost unbroken fields along the road sloping down to the river, their green or copper colored leaves contrasting curiously with the blue water.

Ten miles from the Jupiter River the Lake Worth region is reached. Comparatively unsettled until the advent of the railroad, this part of the East Coast bids fair to become one of the most prosperous as it is one of the most attractive portions of the State. At West Palm Beach, directly across the lake from the Royal Poinciana, Mr. Flagler's latest and largest hotel, is the terminus of the "East Coast Line"—the southernmost railroad in the United States

Concrete and Iron Arches.*

The combination of iron and concrete in construction was first introduced by Jean Monier, who was engaged in 1876 near Paris in the gardening business. As part of his business he built large pots for trees, and to increase their strength he imbedded wire netting in the concrete forms of which they were made. This process of construction was employed later in the construction of large water and gas tanks, still later it was applied to sewer construction and finally to vaults, arches and flat floors.

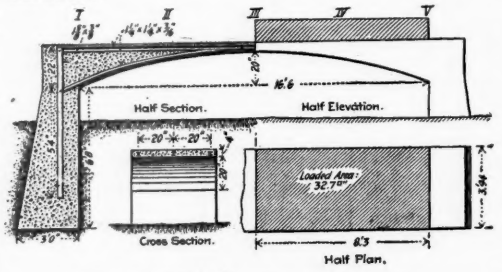


Fig. 1—Wunsch Concrete and Iron Arch.

It is often said that by the use of Portland cement mortar, stone bridges can be reduced in size 10 per cent. Experience in Germany has proved, however, that with concrete and its monolithic properties a saving of 25 per cent. is attainable. A stone arch must be constructed for pressure only, while in concrete one-tenth of the pressure (Engesser says one-seventh) may be taken up as tension.

The leading idea of the use of iron with concrete is to strengthen the monolithic concrete block against tension, that the unavoidable waste of material involved by a low tension limit and a ten times higher pressure limit may be overcome. This enables us to build flat as well as thin arches, saving 67 per cent. and more in comparison with stone.

The genuine Monier system had only one wire netting on the intrados, but this was not sufficient, as tension occurs on the intrados as well as in the extrados.

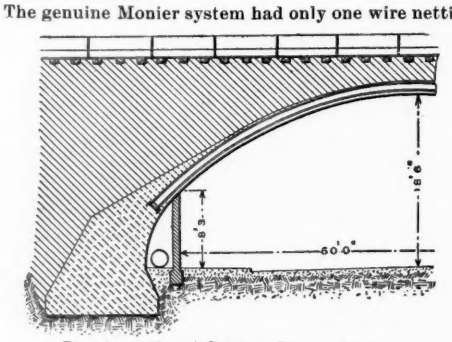


Fig. 2—Railroad Bridge, Brunn, Austria.

* Notes from a paper read before the American Society of Civil Engineers, April 4, 1894, by Fr. von Emperger, C. E.

Two nettings were therefore used, and tests have clearly demonstrated the superiority of this combination over any arch construction of brick, stone or concrete alone.

The iron netting used with the Monier system is not stiff itself and its co-operation with the concrete can be expected only after it is hardened. If the work is carefully done with good cement, and the center allowed to remain until it is thoroughly set, there need be no danger.

This delay to allow hardening has been obviated in a degree by another system now in use which employs rolled shapes instead of wire netting. The inventor of this latter method is R. Wünsch, of Buda Pesth, Hungary (1884). Six highway bridges have been built under this system, all in Hungary, their spans varying from 13 to 55 ft. The difference between it and other systems is that he builds a very simple trussed bridge of rolled shapes and then completely embeds it in cement. Such an arch construction gives little if any horizontal thrust, and is therefore especially adapted to arches for doorways, windows, etc., to be supported by piers and columns.

Fig. 1 illustrates a 16.6-ft. Wünsch arch and one of a great variety of test loadings made by the Hungarian Government to determine its strength. (See page 494, *Railroad Gazette*, 1893.) The structure was designed to carry 80 lbs. per foot. The following table shows the results of those tests:

Total load.	Load per sq'a're foot.	Deflections at point. II.	III.	IV.
Pounds.	Pounds.	Inches.	Inches.	Inches.
2,844	88	.....	.....	0.04
5,949	105	.....	0.04	0.04
8,356	258	.....	0.16	0.16*
11,673	360	0.04	0.27	0.27†
16,082	4.0	.....	0.59	0.55‡
18,287	565	0.75	2.64	1.97§
33,101	1,010	.....	15.75	.....

* Between sections I., II. and IV., V., fine cracks (see plate).
† Crack unchanged.
‡ Crack open to 0.08.
§ Cracks increase slowly until the breakdown.

There was no measurable horizontal motion of the abutment, and it is claimed as a most important property of this system that the horizontal thrust is changed to a lift by the anchorage.

The latest improvement in this line is called, after the inventor, Professor J. Melan, of the Technical College of Brünn, Austria, "System Melan," Fig. 2. It consists of bent I-beam with a concrete body between and no cross-rods at all. It is a very remarkable saving of iron, and gives greater strength. The beams are, of course, the stiffest shape to be had. They amount to a centering by themselves. It is not difficult to show that these bent beams would safely carry alone the load intended, and it is hard to understand why this simple construction has not been thought of before. Simplicity in all details is a property which will certainly be appreciated in this country. No strain sheets, no worked-out plans, are needed. All that we must know are four figures—span, rise, section of beam, anddistance between. The bending is done in the mill at a cost of ½ cent per pound or less, and there are no other connections but splices to prolong the beams. All that the workman has to look after is to keep the beams flush. After these are once in place, the centering can be finished in accordance with the given line. The centering need not be heavy; it has not to support the entire structure as with other concrete systems, or with stone arches until the keystone is laid. It supports only one ring, and that only partially, until the concrete has set. The work does not need to be hurried, as the concrete can be laid in rings between the beams. It should be laid in layers and well rammed.

A survey of these three systems prompts the inquiry, Which one gives, with the same amount of steel and concrete, the strongest arch? The Austrian Society of Engineers and Architects undertook a series of tests with arches from 7 to 77 ft. span. The following table gives the first four tests of this series and one by the Hungarian Government.

The Monier arch had two wire nets 2⅜ in. × 2⅜ in. meshes and $\frac{3}{16}$ rd. wire. The Melan arch had 3½ I beams, 4.3 lbs. per foot, and 40 in. apart, and was one year old. The Wünsch arch had 1¼ × 1¼ × $\frac{3}{16}$ angles with the

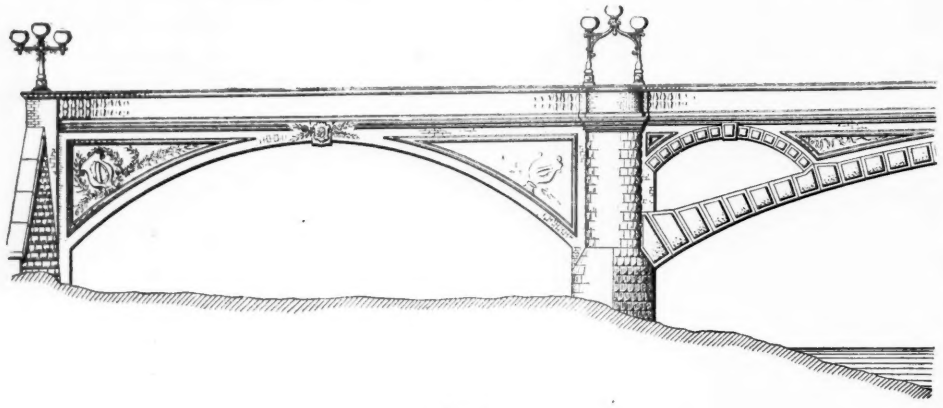


Fig. 3.

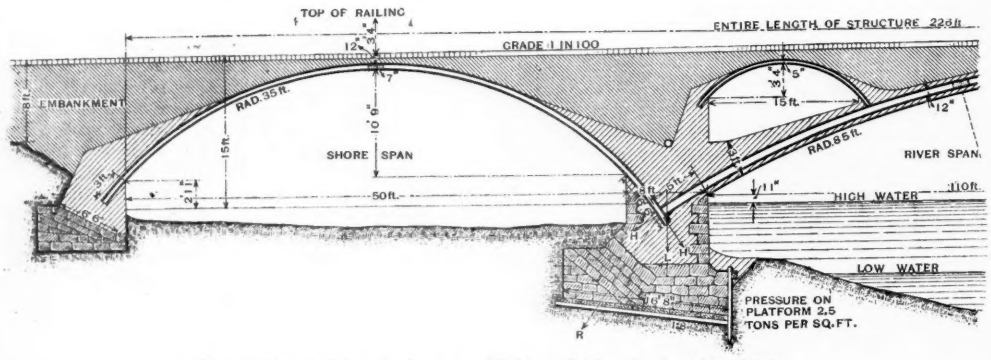


Fig. 4—Competitive Design of a Highway Bridge for Lansing, Mich.

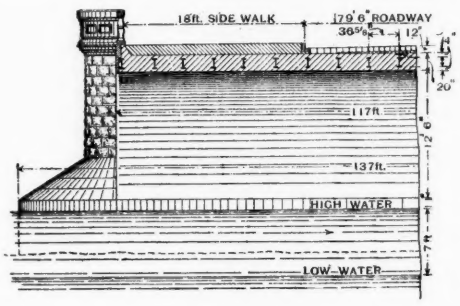


Fig. 5.

Material.	Span. Feet.	Rise. Inches.	Thickness in crown. Inches.	Steel. Pounds per square foot.	Breaking load. Pounds per square foot.
Brick with cement mortar	13⅛	15¾	6	....	321.5
Concrete	13⅛	15¾	4	....	787.3
Monier	13⅛	15¾	2⅜	8	839.7
Melan	13⅛	11.0	3⅛	1.4	3,360
Wünsch	16.4	20.0	4	1.5	1,010

poorest concrete, and was only one month old, which explains its poor showing. The test arch Melan was designed for a total load of 200 lbs. per square foot, and nobody expected so high a breaking load. The arch was broken down by loading only one rib in the most dangerous manner by a square of 10 sq. ft. (see fig. 6). The first cracks appeared with 3,000 lbs. per square foot, and the arch broke slowly down under 3,360 lbs. per square foot. This is certainly a load which the 3⅛-in. beam alone never could stand. The safe load of this I beam (span 13⅛ ft.) is 73 lbs. per running foot, and it carried 11,200 lbs. per running foot, but if compared with the bent I beam of the same span, this beam is strong enough to carry the load alone. It is the writer's opinion that a coefficient of safety of 5 is not sufficient, and 10 is entirely warranted if uniform safety is wanted for such different material as iron and concrete.

The best concrete in crown and in the outer fibers is 1 to 5; in the haunches, 1 to 7; and in spandrels, 1 to 9. These figures are the highest the writer has heard of, the usual practice being always lower. One to 3 to 6 is recommended by Mr. A. Rella, an expert in this kind of work, wherein 1 to 3 means the mortar and 6 gravel; if broken stone is used, which for that work is the more desirable material, the proportion is changed to 1 to 3 to 5, in which the stone (5) is made up of 1 part of gravel and 4 parts of broken stone. All Monier work has been done with 1 to 3 mortar, no stone being used. Wünsch, on the other hand, sometimes used 1 to 15, but such reduction needs some experience in handling and choice of materials, and cannot be recommended generally. In no case should a concrete bridge be subjected to severe tests before three months.

In considering those properties of iron and cement which make both materials especially fit to be used together:

1. The modulus of elasticity of concrete (after Professor Boeck) is about $\frac{1}{10}$ of that of mild steel. This great difference enables us to have in the same part of a structure a small stress in the concrete and a 40 times larger one in the steel.

2. Professor Bauschinger found the cohesion between iron and concrete, after hardening, to be from 570 to 640 lbs. per square inch. This is more than the tensile strength of the best concrete. It acts like a glue if once hardened.

3. Concrete is the best conservator of iron. The writer knows of a case where iron rods were found perfectly rust free having been imbedded in concrete below water level for 400 years. For the protection of iron, concrete is better than paint.

4. The thermic expansion of both materials is the same, and change of temperature will not cause secondary stresses.

Having reviewed the properties of the materials used, and their application, as well as the calculation for these arches, there remains to be said something of their usefulness for bridges.

The main features of this construction are:

1. There is no expense for maintenance of the bridge, the iron being entirely covered.

2. There is no expense necessary for maintenance of the road, or, at least, no more than for any other part of it.

3. There are no vibrations and practically no noise, and the bridge is not affected by a change of live load.

4. They are tornado and high-water proof.

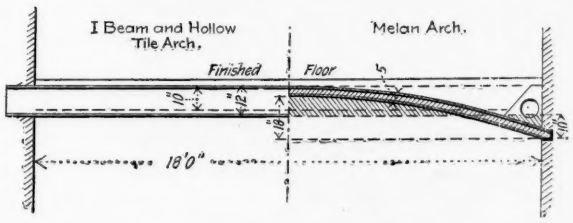


Fig. 6--Comparison of Floor Systems.

5. They have a solid appearance, which can be architecturally developed in accordance with surroundings.

6. Cheap construction wherever sand and gravel are at hand.

In short, they possess all the advantages of a masonry bridge, at the cost of an iron one.

The Melan system avoids any riveting in iron, and is up to the present time the cheapest as well as the strongest, as the tests have shown. This system is now in its second year, but the writer found it wise not to publish it before it had been thoroughly tested. Its largest field is its application to floors and vaults, to which a new system can be readily introduced, as they are not controlled by government inspectors and depend more or less only upon the will of the owner.

Fig. 6 shows a comparison of the usual floor system and of the system Melan, and the comparison of prices of steel necessary are given as 12 cents for hollow tile floors for 200 lbs. loading per foot, and 5 cents per square foot for steel for Melan system.

Fig. 7 shows a test to which this floor system was subject. The spans are 7 ft. and the ends of the two outside abutting girders are connected by heavy beams.

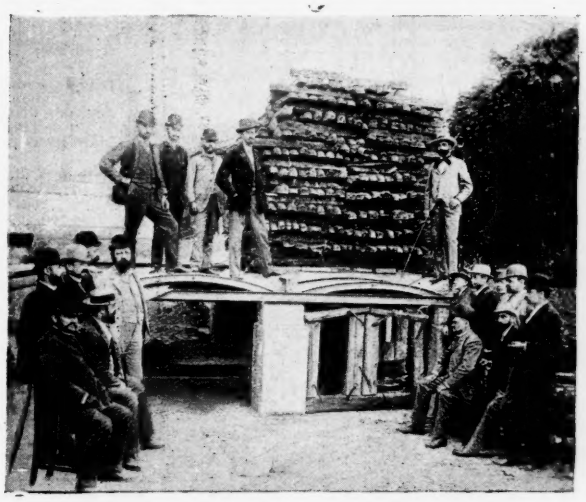


Fig. 7—Test of Melan Arch for Floors.

The middle girder yielded only ⅛ in. although free when the loading shown, which was 2,400 lbs. per square foot, was applied.

It is now quite common in Europe to specify, for buildings similar to office buildings, vaults with Monier arches. This is almost as common in Europe as the hollow brick floors (which are not used there at all) are here. Nearly 1,000,000 sq. ft. of the Melan type of floor has been built during the first year of its life, while of bridges the writer mentions besides that of 23¹ ft. span near Neustadt, two others; a bridge over the Struschka, near Oderberg, 39¼ ft. span; a 65½ ft. span over the Moldau bridge; and a 50 ft. span for railroad tracks being constructed over a street at Brünn, Austria, shown in fig. 2.

Finally, some words about exterior finish. The cheapest is the concrete finish itself, with some fancy joints. The concrete can be colored by using chips and sand from colored stones, and Mr. Ransom gives them, with the use of wooden patterns, a stone-like appearance. In Germany they imbed large stone in the face wall. The best material, which also gives for the smallest money the richest appearance, is terra-cotta.

Figs. 3, 4 and 5 show a competitive design of a highway bridge for Lansing, Mich., designed by Mr. von Emperger.

Fig. 2 shows a detail at the left that is interesting, the insertion of a butting or anchor member in the shape of an I beam at the ends of the arched ribs. This bridge is now in process of construction at Brünn, Austria. Fig. 4 has been specially designed for a highway bridge, and embodies what the author deems the best practice for America, under the same local conditions.

Fig. 6 illustrates two cross-sections of a subway, the one at the left is the construction adopted for the Sacramento street subway of Chicago, while the right-hand part of the figure is a design, showing the adaptation of the system Melan to the same structure. The conditions attending such a structure are unusual, the height being only 15 in. The Melan arch can be employed with perfect safety.

The accompanying bill of material shows that the masonry in both cases is about equal, while there is a saving of 1,100 lbs. steel per running foot, which gives for the whole subway a saving of 55 tons of steel.

BILL OF MATERIAL PER RUNNING FOOT.

Sacramento Subway.

IRON.

15 in. 80 lb. beam, 22 ft. lg., 2 ft. ap	880
10 in. 25½ lb. beams, 8½ in. lg., 2 ft. ap	216
25-in. girders	300
12 in. chan. lat. column	60
Total	1,456

Melan Arch.

10 in. 25½ lb. beam, 32 ft. lg., 3 ft. ap	272
6 in. 13 lb. beam, 10 ft. lg., 3 ft. ap	87
Total	359

MASONRY.

Sacramento subway	6.8 cu. yds.
Melan arch	6.1 cu. yds.

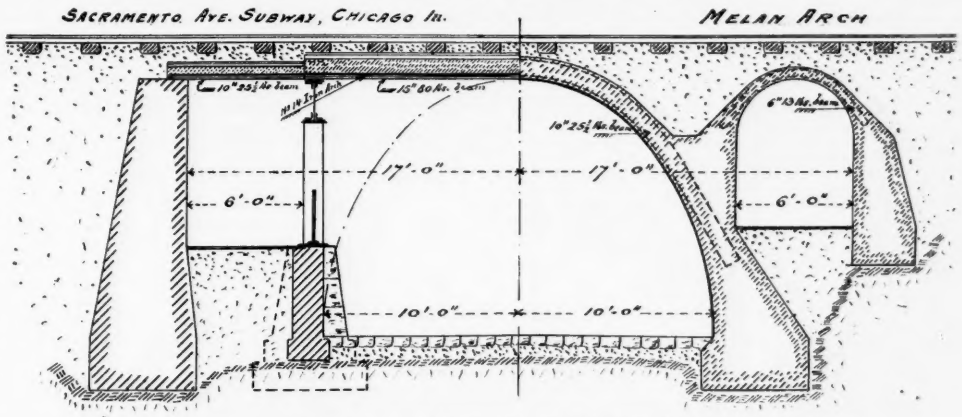


Fig. 8—Comparative Design Showing Melan Arch and Ordinary Construction of Subway.

Railroad Building in Colombia.

The Cartagena-Magdalena Railroad in Colombia has been in operation for part of the distance to the Magdalena River for about six months and has carried an important traffic. We have followed the construction of the railroad pretty closely, because the enterprise is projected by an American company and it promises to be of considerable importance in developing trade with the United States. In the *Railroad Gazette* of April 1, 1892, April 14 and July 14, 1893, particularly, the route and country traversed were described in some detail. The road is being built by the Cartagena-Magdalena Railway Co., of which many well-known Boston and New York business men are directors. Hon. T. Jefferson Coolidge, of Boston, formerly United States Minister to France, one of the directors of the company, has recently returned to Boston from a trip to Colombia, and sends us the following notes concerning the progress of the line and the present business conditions in Colombia:

"The railroad extends easterly from Cartagena to Calamar on the Magdalena River 60 miles. It will be completed by July, and is now operating 20 miles to Arjona. The river is 1,500 miles long, and at low water has a larger volume of water than the Nile at low water. It is navigable to the Yegua, about 500 miles from the mouth. From Yegua, Bogota is reached by a mule path ascending 8,000 ft., and which takes three or four days to accomplish. The State of Colombia is immensely rich. Coffee, cocoa, bananas, limes, grow in the greatest abundance. The forests are filled with mahogany, lignum vitæ, fustic, logwood and palms of every description, and gold and silver are found in abundance. But the climate, until you ascend the mountains, is extremely hot. The inhabitants wear little or no clothing; for food they have the greatest abundance of fish, the bread-fruit tree, the papaw, the plantain and the banana, for which they have only to reach out their hands. This, of course, has interfered with demands for foreign goods. The business, until now, has been done very largely through the town of Savanilla, which is at the mouth of the Magdalena River, below the bar, which is an open roadstead where vessels lie at a pier 4,000 ft. long exposed to the weather. The bar is impassable for vessels. Now, the harbor of Cartagena is a magnificent land-locked inland water, perfectly protected from wind and wave, and so deep that there is 40 ft. at the railroad wharf. It is for that reason that the projectors of the road considered that the exports and imports would, to a great extent, be carried by a line built from Cartagena to Calamar, where the goods would be transhipped on river steamers. The passenger fare on the

completed section is two cents a mile for second class passengers, there being but very few first class.

The road is well built and has met with no serious engineering difficulties except the enormous fall of water, which takes place during the rainy season. This has necessitated four times as much ballast as the original estimates and rock is very scarce. The river rises from 15 to 18 ft., and is liable to flood part of the country. The soil is rich and serves as pasture ground for large herds of splendid cattle. The ties are of wood, but I think that in such a climate these wooden ties will be replaced by steel. The bridges, of which only two are of any importance, are of wood. The absence of stone to make the abutments prevented their being made of steel. There is no hill over 600 or 700 ft. in height. The road is narrow gage, 45-lb. steel rail, and has cost more than double what such a road could be constructed for in the United States. Cartagena is a town of about 20,000 inhabitants."

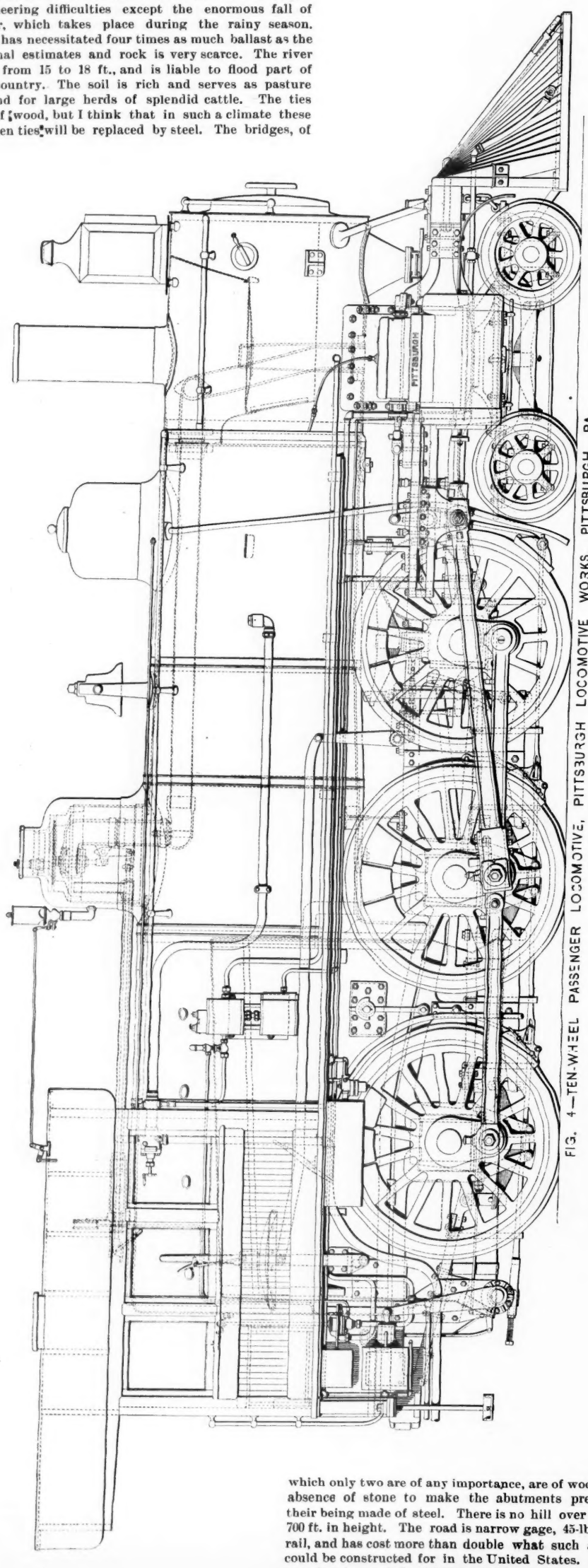


FIG. 4—TEN-WHEEL PASSENGER LOCOMOTIVE, PITTSBURGH LOCOMOTIVE WORKS, PITTSBURGH PA.

Pittsburgh Ten-Wheel Passenger Engine.

The engravings printed herewith show a 10-wheel passenger engine built by the Pittsburgh Locomotive Works for the Terre Haute & Indianapolis Railroad. It was one of the exhibits of these shops at the World's Fair.

GENERAL DIMENSIONS.

Type	Ten-Wheel Passenger
Name or Number	1450
Name of builder	Pittsburgh Locomotive Works
Name of operating road	Terre Haute & Indianapolis
Gage	4 ft. 9 in.
Simple or compound	Simple
Weight on drivers	110,000 lbs.
" " truck wheels	28,000 lbs.
" total	138,000 lbs.
Wheel base, total, of engine	23 ft. 8 in.
" " driving	13 ft. 4 in.
" " total (engine and tender)	57 ft. 7½ in.
Length over all, total (engine and tender)	61 ft. 6½ in.
Height of stack above rails	15 ft. 5⅝ in.
Heating surface, firebox	158 sq. ft.
" " tubes	2,078 sq. ft.
" " total	2,236 sq. ft.
Grate area	32 sq. ft
Wheels and Journals.	
Drivers, number	6
" diameter	72 in.
Journals, driving axle, size	8 × 10 in.
" truck "	5½ × 10 in.
Main crank pin, journal	5¾ × 6 in.
Cylinders.	
Cylinders, diameter	20 in.
Piston, stroke	26 in.
" rod, diameter	3½ in.
Main rod, length center to center	9 ft. 6⅝ in.
Steam ports, length	18 in.
" width	1⅜ in.
Exhaust ports, length	18 in.
" width	3 in.
Valves.	
Valves, kind of	Richardson balance
" greatest travel	⅝ in.
" outside lap	1 in.
" inside lap or clearance	1/32 in.
" lead in full gear	1/16 in.
Boiler.	
Boiler, type of	Reduced shell
" working steam pressure	180 lbs.
" material in barrel	homogeneous steel
" thickness of material in barrel	9/16 in.
" diameter of barrel	64 and 70 in.
Seams, kind of horizontal	butt joints, double welded sextuple riveted
" " circumferential	Double riveted
Thickness of tube sheets	½ in.
" " crown sheet	⅜ in.
Crown sheet stayed with	radial stays, 1⅛ in. diam.
Dome, diameter	30 in.
Tubes.	
Tubes, number	300
" outside diameter	2 in.
" length over sheets	13 ft. 2 in.
Firebox.	
Firebox, length	9 ft. 6 in.
" width	3 ft. 4⅜ in.
" brick arch?	Yes.
" water space, width; front, 4 in.; sides, 4 in.; back, 4 in.	
Grate, kind of	Cast iron, rocking
Other Parts.	
Exhaust nozzle	Single
" " diameter .. (4 sizes), 4½ in., 4¾ in., 5 in., 5¼ in.	
Stack, straight or taper	Straight, with pressed steel base
" least diameter	15⅞ in.
Tender.	
Weight of tender, empty	29,300 lbs.
" " with fuel and water	76,600 "
Kind of tender frame	Oak
Type of tender truck	Diamond
Wheels	Chilled iron, 36 in.
Size of journals	4 in. × 8 in.
Capacity of tank	4,000 galls.

The engine has the American air brake and the Westinghouse train signal. The cylinder head and steam chest casings as well as the dome top, smokebox front and sandbox, are made of compressed steel. The guides and crossheads are of steel, of the Laird type, and the brakes have Ross steel shoes. There are two No. 10 Mack injectors and a No. 9 Nathan lubricator.

Shop Tests of Locomotives.

The committee of the Western Railway Club appointed to consider the utility of shop tests of locomotives, reported at the February meeting of the Club in substance as follows:

The committee recognizes the dissimilarity of the conditions met with in road and shop tests. A shop test separates the conditions and so maintains them till the results sought can be obtained. Below is given a number of features of locomotive design, regarding which much needed information will be supplied by shop tests.

First. Front end arrangement: to devise the best arrangement for a particular type of engine, kind of coal and service. The results should give the best vacuum with least back pressure.

Second. Economy of evaporation at different rates of combustion. It might be found that while one kind of coal was most economical at low rates of combustion, another kind, at much higher first cost, would prove altogether cheaper with forced combustion. Much could be learned concerning the relative efficiency of deep and shallow fireboxes.

Third. Economy of throttling steam vs. working more expansively.

Fourth. Economy of compounding, the actual cylinder economy and the conditions best suited for compounding would be determined. The ratio of cylinders for compounds would be determined.

Fifth. Effect of raising steam pressure upon the economy of both simple and compound locomotives.

Sixth. Actual steam economy of locomotives at various speeds and loads.

Seventh. Effect of different proportions of valve motion on traction at various speeds.

Eighth. Internal friction of the various types of locomotives.

Ninth. Effect of various proportions of balancing upon steadiness of running, pressure on track, machinery friction and tendency to slip.

Tenth. The rapidity and direction of circulation of the water in various parts of the boiler.

The members of the committee were, Geo. Gibbs, D. L. Barnes and Jno. W. Cloud.

At the same meeting Prof. Goss, of Purdue University told what arrangements were being made to replace the testing laboratory at the University. The labora-

tory was recently burned and the locomotive and its equipment, with which the many interesting and valuable experiments have been made during the last year, was more or less injured. The University has funds sufficient to replace the four-wheel connected engine in as good condition as before the fire, but it seems desirable that when the testing apparatus be replaced, it be made suitable to receive for test the heaviest locomotive built and to provide means of getting any locomotive on or off the friction wheels. The University has not means sufficient to provide the extra equipment this would require, and as the railroads will derive the most benefits from the tests that would be conducted, it seems but right that the railroads provide the necessary aid. It was explained that if this was done, tests ar ranged by, and under the directions of the Master Mechanics' Association might be made at Purdue in return for such favor.

A committee, consisting of Willard A. Smith, G. W. Rhodes, Prof. Goss, Geo. Gibbs and J. N. Barr, was appointed to bring the matter to the attention of the General Managers' Association of Chicago, and to indorse the action of the Master Mechanics' Association on the same subject.

Trials of the British Torpedo-Boat Destroyer "The Hornet."

The official trials of the torpedo-boat destroyer "The Hornet" were concluded on March 26th, and the results have been made public. The vessel was first given a three-hours continuous run, during which she made six different runs of one mile each, at speeds varying from 26.08 to 28.48 knots an hour, and an average of 27.31 knots. This was followed by a straightaway run of three hours, at a mean speed of 27.628 knots (30.5 miles.) The engines made 388.3 revolutions a minute, and developed 4,000 indicated H. P., with a steam pressure of 169 lbs. and an air pressure of 1½ in.

On Feb. 23 the same boat, in a preliminary trial, made a 30 knots an hour rate for a single mile at a time for three out of seven trials. This is said to be the highest steaming speed yet attained by any vessel. On this occasion the engines made 400 revolutions, the steam pressure being 172 lbs. and the air pressure 1 in.

"The Hornet' is 180 ft. long, 18 ft. 6 in. beam, and at a mean draft of 5 ft. has about 220 tons displacement. Her propelling engines are twin triple compounds of the Yarrow design for torpedo boats. The cylinders are 18 in., 26 in., and 39½ in. in diameter respectively, the piston stroke being 18 in. Her boilers are eight in number, having a total heating surface of 8,216 sq. ft. and a grate surface of 154.8 sq. ft., the furnace bar length being 6 ft. 6 in. They are arranged in two stokeholds in groups of four, each pair of boilers having a funnel. Her cost is estimated at $164,500.

Yarrow Water Tube Boilers.—This phenomenal speed is attributed largely to the Yarrow water-tube boiler, which the *Engineer* of Nov. 17, 1893, describes as follows:

Two inclined nests of tubes are connected to the lower part of a horizontal cylindrical vessel in such a way as to form sides of a prismatically shaped firebox, each nest terminating in a wrought iron chamber or pocket, the two pockets forming the bottom of the boiler. A transverse section would show a figure resembling an equilateral triangle, of which the two nests of tubes would form the sides, the fire grate the base, while the horizontal cylinder is supported to the apex. The pockets enable the water to circulate freely through the tubes, generally coming down through those at the outside and farthest from the flames, and passing up the inner ones, on which the flames impinge. The advantages claimed are: First, lightness of structure; second, rapidity of generation, and third, durability. The boiler is light for the horse power given, which is estimated at 781; the weight, inclusive of mountings, uptake and funnel, being only 5 tons 7 cwt.

The absence of leakage is due to two very important features: First, that the tubes are perfectly free to expand, and being solid drawn one inch copper tubes, have a certain amount of elasticity, which reduces the evil effects of unequal expansion to nothing; secondly, the connections are not exposed to the greatest heat of the fire, which is the case with fire-tube boilers, where the junction of the tube with the tube-plate is such a great source of trouble, the fluctuations of temperature taking place on the solid metal and not on the joint. The accessibility of the tubes is also a striking feature.

The progress of the trial on the 14th inst. was as follows, fresh charges of Welsh coal being thrown on at intervals of three minutes, keeping about 6 in. of fuel in the bars, which cannot be considered a heavy fire: In 10 minutes after lighting up, steam began to show, the water level being at about one-third of a glass. In 2½ minutes more the pressure was 25 lb. In another minute and a half there were 40 lb.; *i. e.*, in 14 minutes after lighting up, the pressure continuing to rise at the rate of 10 lb. per minute. At 90 lb. the feed-donkey was started. At 100 lb. the steam blast was turned on, maintaining an air pressure of from 3 in. to 3½ in. of water, only 20 minutes having elapsed since the fire was lit. In another 2½ minutes there was 180 lb. The steam was then allowed to blow off freely into the atmosphere at 180 lb. for 32 minutes, when the blast was shut off and the fire suddenly drawn. Notwithstanding the severity of this test, there was no trace whatever of leakage, the boiler not being in the slightest degree impaired.

Comparative tests of the Yarrow boilers with locomotive boilers have been made in two boats that are identical in other respects. In the boat containing the two locomotive boilers the machinery indicated on trial about 3,500 H. P., with an air pressure of 3 in., while in the sister ship, provided with similar engines fitted with eight water-tube boilers, as previously mentioned, they obtained, with a very low air pressure, averaging 1¼ in., 4,300 H. P. The eight Yarrow boilers weighed 11 tons less than the locomotive boilers.

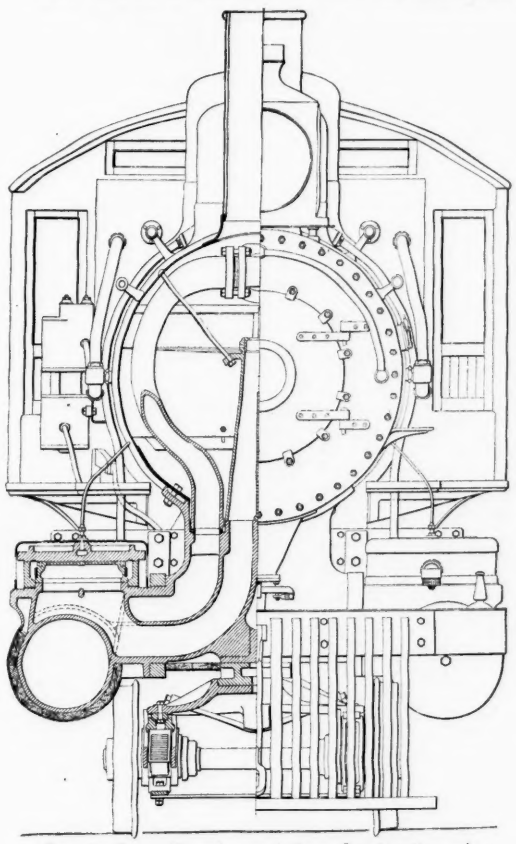


Fig. 1—Front Elevation and Cross-Section through Cylinder.

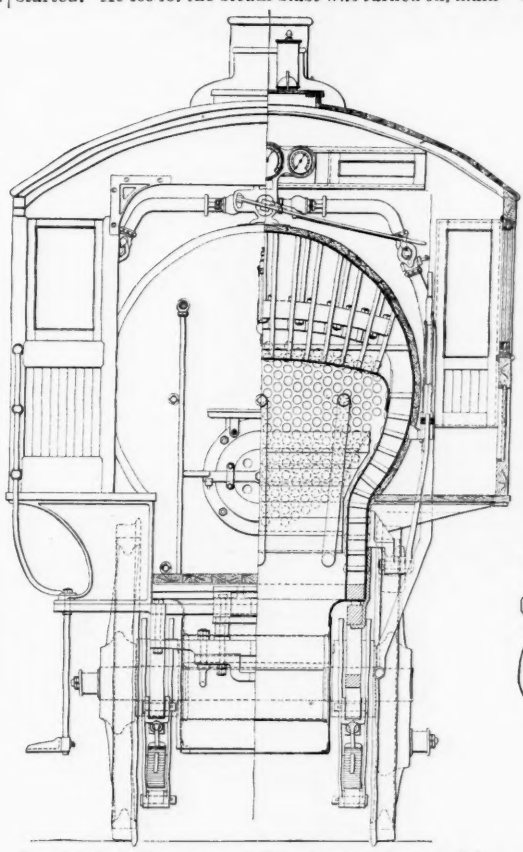


Fig. 2—Rear Elevation and Cross-Section through Cab.

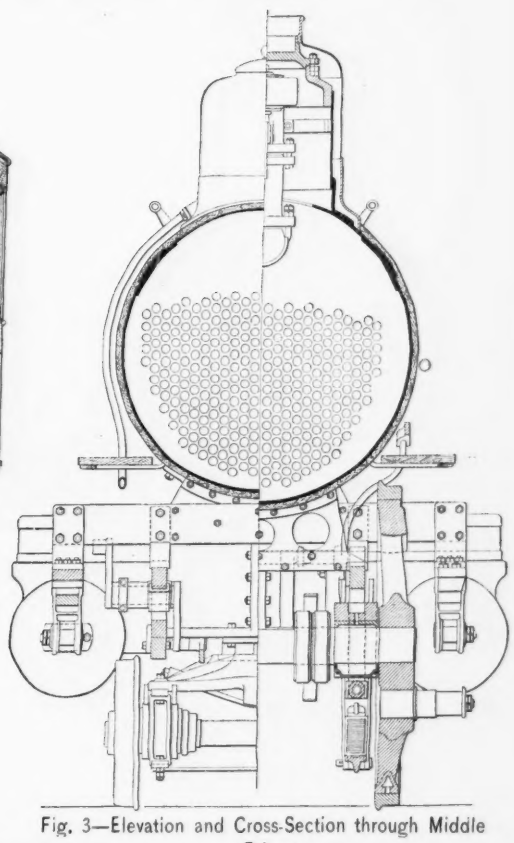


Fig. 3—Elevation and Cross-Section through Middle Driver.

TEN-WHEEL PASSENGER LOCOMOTIVE, PITTSBURGH LOCOMOTIVE WORKS.

Scientific Work at Cornell.

A recent visit to Cornell University, at Ithaca, revealed some very interesting work. We give only that which is being done in the technical departments as being of interest to *our* readers.

In the Civil Engineering Department one finds the Director just completing a report upon the sanitation of the city of Santos, Brazil, which is one of the greatest undertakings of the day in sanitary engineering. In connection with sewerage, two resident graduates are investigating the effects of flushing upon sewers, their object being to determine: how far the effect of flushing will be felt in sewers of different sizes; how far apart the gates and tanks must be placed in reference to the quantity of water used; the diameter of the sewer and its gate. Experiments have been conducted upon open channels of great length provided with gates, and electric devices have been adopted which record the instant at which the front of the wave reaches various points of the sewer. The depth of the advancing wave and its velocity at every 10 ft. are also determined. In some experiments the water has been colored and it records its own history upon a long strip of paper as it flows down the grade.

An interesting series of experiments have been made to determine the resistance to the flow of water through orifices of all kinds and sizes and under heads up to 300 ft.; and a line of experiments that will give specially interesting results will determine the modulus of elasticity of steels. A large number of experiments have been performed and the results tabulated.

For 20 years the relative amount of rainfall for short periods has been determined and records kept; and for 10 years past a complete and continuous record has been made for every minute of the day. These investigations also extend to the rate of rainflow from given watersheds under various conditions of the surface, and systematic observations are being made to ascertain the amount of evaporation under normal conditions.

The experiments noted recently in these columns to determine the force and velocity of the wind are being continued. Instruments have been devised which record simultaneously on four different sheets of paper the horizontal component of the wind, its vertical component and its direction; and when the velocity exceeds 15 or 20 miles per hour another machine is automatically thrown into electrical circuit so that every revolution of an exceedingly delicate anemometer can be recorded. This instrument often exhibits gusts of extraordinary intensity when the ordinary anemometers record only moderate velocities.

The United States Coast Survey has two officers at the university determining the force of gravity by swinging three half second pendulums of the new pattern devised by Superintendent Mendenhall.

Another series of experiments undertaken by two post-graduate students is the determination of the effect of impact upon the members of different types of bridges. These experiments show the elongation or compression of the full-sized members from pin to pin, and the elongation has not to be read by the observer, but the whole phenomena are self-registered on strips of paper. By it the effect of every revolution of the driving wheels of a locomotive is apparent, and it is shown for every panel point as the engine approaches the one containing the member being tested. A locomotive has been placed at the services of the experimenters, and some very valuable information is certain to be derived from the experiments.

There has been recently installed a new testing machine equal to 400,000 lbs. tension and 100,000 lbs. for transverse tests. This machine will take specimens of all lengths up to 10 ft. in tension and 12 ft. in compression, and transverse tests can be made with thicknesses between 8 and 20 in., and 18 ft. between points of support. Electrical connections are employed during all stages of the tests to register the phenomena attendant. The College of Civil Engineering, for years

past, has made physical tests of material of construction for municipal and railroad corporations as well as for private parties, and reports have been made free of charge for professional services. It does not purpose to furnish reports to be used for advertising purposes, although it does make tests including physical and mechanical, biological and microscopical examinations, and tests of materials for either private or public purposes, furnishing a detailed description of the material, the methods employed in the tests and the results obtained, but without comments. The only charge made in these cases is for the materials or supplies, the unskilled labor necessary to handle the material, and operate the testing machines and apparatus. Railroad companies, cities, water, gas and other public works should avail themselves of this privilege at such a mere nominal expense.

The Mechanical Engineering Department, known as the Sibley College of Mechanic Arts, is making preparations to install an experimental plant to consist of a standard simple and a standard compound locomotive for experimental purposes, to be erected and equipped somewhat, though not exactly, similar to the one at Purdue University recently destroyed. The fine new building lately erected will furnish ample room for the installation of this locomotive plant. The locomotive builders of the country have shown a very liberal spirit in consideration of the value that such an experimental plant will be to their own and railroad interests. The details of the equipment are not fully decided upon, but the formation of a locomotive testing station is now fully assured. The station will be located in close proximity to the D., L. & W. and Lehigh Valley tracks in Ithaca and will be planned and equipped so that any locomotive can be run into the laboratory and tested under all conditions and for all purposes. The locomotives purchased will be installed in the laboratory at Sibley College.

It seems almost shortsighted policy for Cornell to have neglected such an important branch of mechanical engineering so long. Possessing as she does the largest and most valuable engineering laboratories in the world—they are very incomplete when they have not representative machines of a class of engines that generates fully one-half of all the power produced by the steam plants of the world.

By ignoring this fact she has been handicaped in giving special courses in railroad mechanical engineering and has sacrificed much of the affiliation and patronage of railroad men that have gone to build up at least one flourishing Western institution. It is earnestly hoped that the trustees and friends of the university will appreciate this want and by concerted efforts provide an experimental laboratory for locomotives and other railroad appliances. It is gratifying to learn that the subject of locomotive design is now taught by an instructor, who has had a large practical experience in the best locomotive shops, and it is quite probable that in a short time a department will give its full time to this important work.

By the extreme liberality of Mr. Hiram Sibley, the founder and benefactor of the College of Mechanic Arts, a new building has been erected 160 ft. in length and 60 ft. in breadth, consisting of three stories and a very commodious and well lighted basement. This will relieve materially the crowded condition of nearly every department.

The new building will be occupied as follows: Basement for experiments in hydraulics and oil testing; first floor for museum and lecture rooms; second floor, lecture and drawing rooms for departments of marine engineering and machine design; third floor for drawing and design.

The total floor surface now available for the technical work at Cornell is approximately as follows: Mechanical engineering and design, 12,700 sq. ft.; electrical engineering, 8,700 sq. ft.; drawing and elementary design, 12,500 sq. ft.; marine engineering, 5,000 sq. ft.; experiment and research, 20,800 sq. ft.; shops for manual training, 18,500 sq. ft.; civil engineering, 36,000 sq. ft.; making a total of 114,200 sq. ft., or 2.6 acres.

In addition to this the hydraulic power and pumping station belonging to the university is available for experimental use.

The colleges of Civil and Mechanical Engineering have registered in the undergraduate courses 671 students and 80 graduate engineers, which latter number does not include graduates from other colleges registered in the regular undergraduate classes. In all departments of the university there are 1,752 students, exclusive of summer schools and the winter course in agriculture.

Coal Trials of Compound and Simple Locomotives.

A test was recently made on the Atlantic City line of the Philadelphia & Reading Railroad to determine whether the small sizes of anthracite coal could be used in locomotive boilers in high speed service. The test was made under the direction of Mr. L. B. Paxson, Superintendent of Motive Power and Rolling Equipment of the road. The following is the summation of the results obtained taken from a pamphlet which gives a report of the tests in detail. The pamphlets are issued by the Baldwin Locomotive Works.

The purpose of the test was to determine which of the two classes of engines was the more economical, whether with either class buckwheat or pea coal could be used, or if either class possessed points of superiority over the other, in high-speed passenger service and was not a test to show whether the compound or single expansion of the same class were the more economical.

The engine hauled the same trains, with the exception that when in service with egg coal, compound No. 694 hauled trains 15 per cent. heavier than those hauled by single-expansion engine 1,016. The coal was weighed in bags containing 125 lbs., the water measured by meters connected with the feed-pipes and the records were as carefully taken as possible. The general dimensions of the two engines follow:

	Compound No. 694.	Single Expansion No. 1,016.
Diameter of cylinders	13 and 22 in.	21 in.
Stroke of piston.	24 in.	24 in.
Valve, extreme travel	5 in.	5 in.
Valve, outside lap.	7/8 in. H. P., 5/8 L. P.	1¼ in.
" inside lap.	1/8 in. neg. H. P., none L. P.	¼ in. neg.
" head in full stroke	1/8 in. H. P., 3/8 in. L. P.	¼ in.
Steam ports	24 × 1½ in. cir.	19 × 1⅝ in.
Exhaust ports	24 × 4½ in. cir.	19 × 3 in.
Driving wheels O. D	78 in.	72 in.
Truck wheels O.D.	48 in.	33 in.
Weight, total in working order.	129,700 lbs.	103,850 lbs.
Weight on drivers.	82,700 lbs.	71,950 lbs.
Boiler, diam. I. D.	66¼ in.	56⅜ in.
Grate surface.	76 sq. ft.	76 sq. ft.
Heating surface, firebox and comb. chamber.	173 sq. ft.	167 sq. ft.
Heating surface tubes.	1,262 sq. ft.	1,157.5 sq. ft.
Heating surface total	1,435 sq. ft.	1,324.5 sq. ft.
Boiler pressure	180 lbs.	160 lbs.

The length of the line over which the tests were made, from Camden to Atlantic City, is 55.5 miles. The average results for the two round trips with each engine and each kind of coal is given in the table.

The cost of the different grades of coal per ton of 2,240 lbs. was $2.25 for egg coal and 70 cents for pea coal.

Compound engine No. 694 could make the runs when using buckwheat coal, only with an excessive amount of care and attention; it was difficult to get enough coal into the firebox to prevent air-holes forming in the fire. At high speeds the wind would blow the coal from the fireman's shovel and the draft would lift the fire from the grates. Probably 10 per cent. of the coal was lost in getting it from the tender to the fire-door. No difficulty was experienced with the pea coal, and with egg coal the furnace door was kept open, and yet the safety valves were continually blowing.

The single expansion engine No.1,016 did with pea coal about as the compound did with the buckwheat coal; the pressure could not be maintained without the use of some lump coal. In the report above no account is taken of the amount of lump coal thus used.

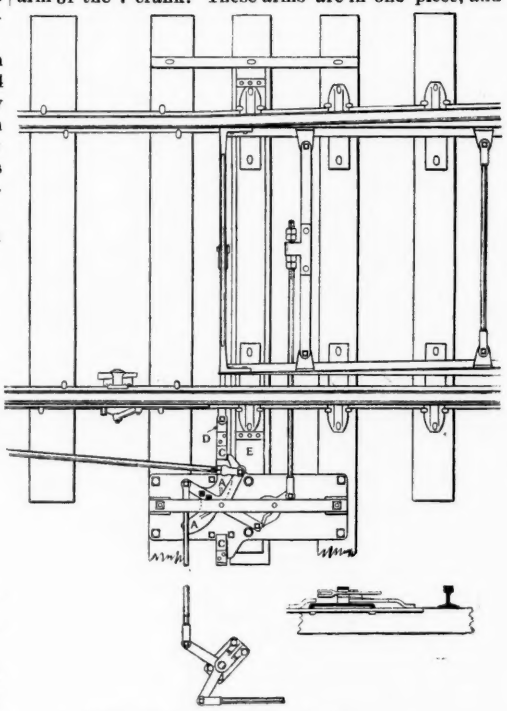
The tests show that the pea coal can be used in a satisfactory manner in high-speed passenger service only on compound locomotives. They show also that the compound locomotive will do as well with pea coal as the single expansion locomotive will do with egg coal, in fact a little better when the actual weight of coal is considered. When the cost per loaded car is considered the compound shows a saving of 68.6 per cent.

COAL TEST—PHILADELPHIA & READING.

	Both locomotives using egg coal.				Both locomotives using pea coal.				Comp. No. 694 with pea coal. Single Exp. No. 1016 with egg coal.		Comparison between coals.			
											No. 694.		No. 1016.	
	Comp. No. 694.	Single Exp. No. 1016.	Percentage favor of— No. 694.	Percentage favor of— No. 1016.	No. 694.	No. 1016.	Percentage favor of— No. 694.	Percentage favor of— No. 1016.	Percentage favor of— No. 694.	Percentage favor of— No. 1016.	Percentage favor of— Egg.	Percentage favor of— Pea.	Percentage favor of— Egg.	Percentage favor of— Pea.
Coal consumed on run, pounds	2,160.	2,955.	26.9	.....	2,750.	3,785.	27.3	.....	6.9	.....	21.45	.....	21.8	.....
" " building and keeping fire, pounds	1,860.	2,430.	23.4	.....	2,437.	2,469.	1.3	.....	.02	.....	23.7	.....	1.6	.....
" " total, pounds	4,020.	5,385.	25.3	.....	5,187.	6,250.	17.0	.....	3.7	.....	22.5	.....	13.8	.....
" " " per loaded car per mile, pounds	12.59	19.41	35.1	.....	18.69	22.54	17.0	.....	.....	.....	.....	.....	.....	.....
Water, total weight evaporated on run, pounds	15,758.0	19,173.	17.8	.....	16,363.4	18,363.1	10.8	.....	.....	.....	.....	.....	.....	.....
" " " equivalent from and at 212 deg. F., pounds	19,380.9	23,580.	17.8	.....	20,123.0	23,450.0	14.1	.....	.....	.....	.....	.....	.....	.....
Equivalent total heat required to develop power, T. U's	23,009,874.	27,998,893.	17.8	.....	23,900,087.	27,687,415.0	14.1	.....	.....	.....	.....	.....	.....	.....
Water evaporated per pound of coal, pounds	7.29	6.48	11.1	.....	5.95	4.86	18.3	.....	.....	8.1	18.4	.....	25.0	.....
Equivalent evap. per pound of coal from and at 212 deg	8.97	7.98	11.0	.....	7.32	6.27	14.3	.....	.....	.....	.....	.....	.....	.....
Coal consumed per square foot of grate per hour, pounds	24.01	31.34	23.4	.....	30.97	40.02	22.3	.....	1.2	.....	22.5	.....	21.7	.....
Water evap. per square foot of heating surface per hour, pounds	9.27	12.39	25.1	.....	9.71	12.01	19.1	.....	21.7	.....	4.5	.....	.....	3.1
Time during which power was developed, minutes	63 5/12	62 1/12	.....	.....	60 5/12	64 11/12	.....	.....	.....	.....	.....	.....	.....	.....
Running time, minutes	69 5/12	68 11/12	.....	.....	68.	70 5/12	.....	.....	.....	.....	.....	.....	.....	.....
Average steam pressure when developing power, pounds	178.3	152.9	.....	.....	169.6	123.7	.....	.....	.....	.....	.....	.....	.....	.....
" smokebox vacuum when developing power, ins. water	4.29	5.12	.....	.....	5.18	5.75	.....	.....	.....	.....	.....	.....	.....	.....
" temperature of feed weter, degs. Fah	42 1	38.5	.....	.....	40.5	40.5	.....	.....	.....	.....	.....	.....	.....	.....
" " of air	44.75	36.9	.....	.....	33.75	40.5	.....	.....	.....	.....	.....	.....	.....	.....
COST.														
Coal on run	$2.073	$2.836	26.9	.....	$0.859	$1.182	27.3	.....	.....	.....	.....	.....	.....	.....
" for cleaning and keeping	1.785	2.332	23.4	.....	0.762	0.772	1.3	.....	.....	.....	.....	.....	.....	.....
" total cost of	3.858	5.168	25.3	.....	1.621	1.954	17.0	.....	68.6	.....	.....	58.0	.....	62.2
" per loaded car per mile, cents	1.21	1.863	35.0	.....	.584	.704	17.0	.....	68.6	.....	.....	51.7	.....	62.2

Johnson's Improved Switch and Lock Movement.

We illustrate herewith an improved switch and lock movement designed by Mr. Arthur H. Johnson The escapement crank for throwing the switch is identical with Mr. Johnson's old design, and the improvement consists of the concentration of the switch and detector bar throwing, and the locking parts, on one base plate, in connection with a simplification and reduction in the number of parts. Instead of the usual plunger locks there are two wing-shaped arms, *A*, *A*, secured to one arm of the T crank. These arms are in one piece, and



Johnson's Improved Switch Movement.

they abut against a hub on the base plate, which hub also carries the center pin for the T crank. The lock-

ing arms perform their function by engaging with lugs, *C, C*, which are riveted to the reciprocating bar *D*, attached to the switch points.

The special features of the lock as compared with that of the plunger pattern are as follows: The parts are fully open to inspection, so that inspectors can assure themselves at a glance as to the accuracy of the lock. This is not true of the plunger lock, as the locking surfaces are hidden by the plunger sheath. The base plate is made long enough to span three ties, and is bolted to the gage plate *E*. This construction is considered better than the old method of fastening a small base plate to a transverse wood tie, gained into the crossties, as the drainage is not affected, and the crossties are not weakened. It will be noticed that it is not necessary to cut into the ties to bring the parts below rail level, as in some other movements.

The Johnson Railroad Signal Co. has experimented with this movement in snowstorms and has found it unnecessary to provide a cover, as snow will not block the movement of any of the parts, except the switch points. A patent has been granted which covers the specific design and arrangement of parts.

Harriman's Railroad Information Sheet.

The demands upon railroad executive and department officials for full and comprehensive data as to the construction, maintenance and operation of the road under their charge are so great that anything which will lessen the trouble of lengthy interviews and research, in order to procure positive facts as to the physical condition of the roadbed and all its appurtenances, is gladly welcomed.

The New York, New Haven & Hartford has adopted Harriman's Railroad Information Sheets for compiling this information, and the book which has been made by Harriman Brothers, civil engineers, of 120 Tremont street, Boston, is on file in the office of Supt. I. N. Marshall, of the Providence Division at Boston, and is for the use of all the department officers. The book is only 22 in. long and 10 in. wide. It contains a title page giving a history of the road and the names of its officers, together with the sheets upon which the information is tabulated; also an explanation sheet showing all of the symbols used, together with their meanings and applications.

The "Information Sheet" is made to a scale of 300 ft. to an inch, and each sheet shows 5,000 ft. of track. It contains a plan and profile and shows every curve and tangent, all tracks and the length of sidings, every bridge, building, section-house, gatehouse, water tower, signal, relay box, frog, switch, cattle guard, telltale, mile post, fence and crossing, and their location with reference to each other and to the base line and the continuous distance from Boston. Side widths of location are given in figures. The plan also shows the extent of the railroad property outside of location and the names of the landowners adjoining the railroad, the taxable value of the property and the character of the land, whether cleared, woody, etc.; and all of the town boundaries are shown.

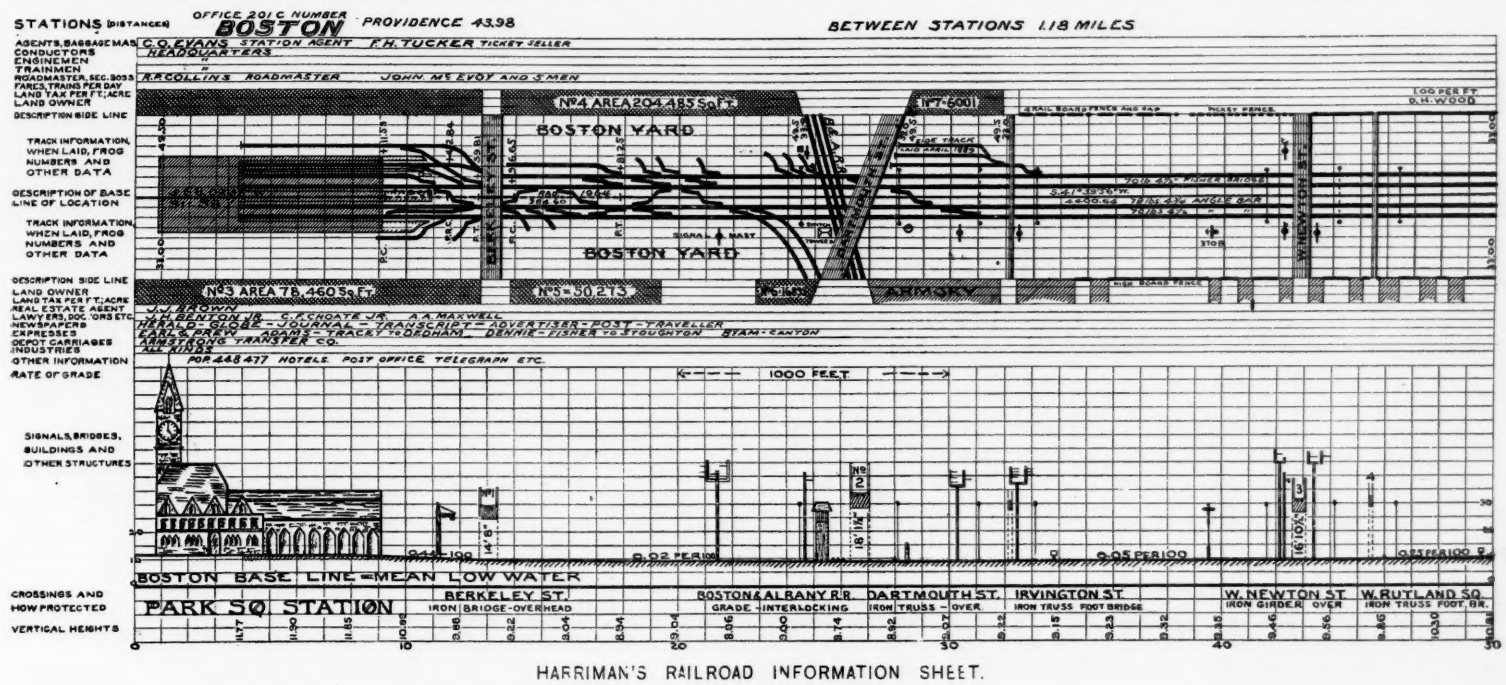
The profile gives the grades and the vertical heights of the track above tidewater at Boston, the heights of the buildings, signals and headroom of bridges and a list of bench marks for leveling.

The spaces on the sheet outside of the plan and profile are utlized for showing the length of each section, the foreman and number of men in each gang, rates of fare, the distances between stations, also from the terminals, the number of trains a day and the amount of business transacted, a list of the agents and other permanent employees, beside giving information pertaining to the different towns through which the road passes, a list of the industries which furnish business to the road, hotels, whether express wagons or carriages may be found at the stations, together with a list of newspapers, prominent men and municipal officers.

Ample room is left for remarks outside of the specified information.

To make the work more graphic and comprehensive to the men who are not familar with plans, colors have been introduced, each having its value and showing the kind of material used in buildings and structures, whether wood, iron, brick, stone, etc.; while the different kinds of fences are shown by dot and dash lines.

We show herewith a sample of the first page of the book prepared for the division referred to. It gives a good idea of the orginal (which is twice as long and twice as wide), except that the column on the left should be duplicated on the right side. On the orignal the grade line and the description of the base line of location are shown in red, and the lower half of the page has horizontal blue lines subdividing the spaces between the black lines into five smaller spaces.



HARRIMAN'S RAILROAD INFORMATION SHEET.

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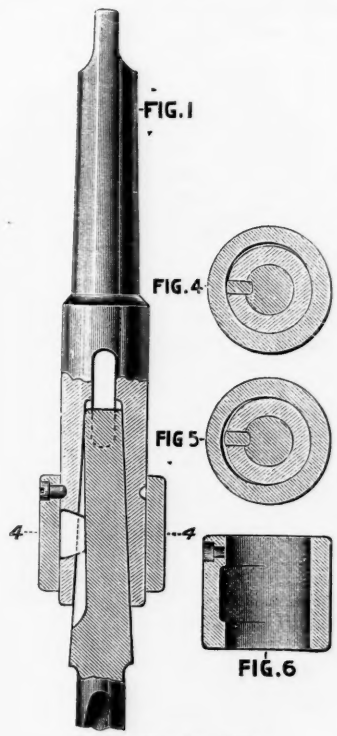
Cleveland Grip Socket for Drills.

A weak point in the ordinary taper shank twist drill is the flattened end of the shank, which frequently fails before the drill is worn out. If the fit is not good it will often cut or ream out the flat recess in the socket. To meet this fault of the taper shank, the Cleveland Twist Drill Co., of Cleveland, Ohio, has invented and patented a grip socket, shown in the engraving.



Grip-Socket for Drills.

A steel key is let into one side of the ordinary socket and its inner side engages in a groove or flattened place prepared for it on the shank of the drill. A slight turn of the eccentrically counterbored sleeve or collar 4, fig. 1, fastens or locks the key securely in its seat, and then the drill cannot be turned in the socket or pulled out. This key is so located in the body of the socket that the tang on the drill will fit into the usual slot or recess prepared for it, and in this way the socket has a double driving power. One advantage arises from the fact that the drill cannot be pulled out till the collar is turned back and the key released. Heavy tools have a provoking way of dropping out of their sockets; drills are dulled or spoiled by tapping them into place with a hammer. The use of this device on spindles will avoid the labor of turning over heavy castings.

These grip sockets will hold straight shank drills, and are furnished with 1/2, 5/8, 3/4, 7/8 and 1 in. holes for such drills. The company proposes to put this groove in the shanks of all its drills so that they can be used in these grip sockets. A drill that has had the tang twisted off can be made good for use in this grip socket by milling a half round groove in the shank, or by filing or grinding the shank, care being taken that such groove has a taper the reverse of that on the outside of the shank. The gripping device has been applied directly to several drill press spindles, and collars will be furnished properly constructed for that purpose.

What Kind of a Man for Fireman?

At the March meeting of the New York Railroad Club Mr. W. G. Wattson, of the West Shore Railroad, read a brief paper entitled "From What Class of Employees Should the Locomotive Fireman be Selected?" His points were summarized in the following: 1. He should be selected from employees in road service. 2. He should be selected from among head brakemen on freight trains, which implies that such brakemen should be selected with a view to this promotion. 3. The fireman should be selected with a view to his becoming a good runner. 4. Wipers are the least satisfactory material to select from. Mr. Wattson also said informally that at present machinists are probably unsatisfactory as a general thing.

In the discussion Mr. Mitchell, of the Erie, agreed with Mr. Wattson that machinists seldom made good engineers. They know the weak points of engines and will not take chances as they should. Mr. Mitchell and other speakers thought engineers' sons made as good firemen as any they had. President Blackall does not allow a son to fire for his father. Mr. Mitchell agreed with this view as the general rule.

The opinion was expressed that braking on freight trains is such disagreeable work that no man of the requisite character and energy for an engineman would now take such a position, but this was denied by other speakers. To controvert the view that the appointing officer should be free to select firemen from any source he chose, Mr. Wattson emphasized the fact that on a large road no officer could select men by his own judgment alone, because, however good a judge of human nature he might be, there would be too many men for him to know all of them sufficiently well. Hence the necessity of some preliminary selection, like making would-be firemen work at braking awhile. Mr. Blackall said that of the 400 firemen on his road 300 possessed the Catechism of the Locomotive, "and they bought the books themselves." Mr. Errickson found that brakemen put at firing often found the work too hard and wanted to go back to braking, so he made a rule forbidding such return.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 73 Broadway, New York.

After May 1, The Railroad Gazette office will be at **32 Park Place,** *one block west of the Post-Office.*

EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Judge Jenkins, of Wisconsin, has finally given a decision on the application of the Brotherhood Chiefs for a modification of his order, issued in December, forbidding them to encourage the employees of the Northern Pacific to strike. He only expunges the clause which restrained them from ordering, recommending, approving or advising others to quit the service of the receivers. * * * In all other respects the motion is denied. The most interesting clause of the decision is that defending the part of the injunction which is left in force. On this point Judge Jenkins says: "The restraint imposed was with reference to combining and conspiring to abandon the service with the object and intent of crippling the property." Thus stripped of the fortifying clauses which appeared in the injunction, this dictum is free from the sharp criticisms that were passed upon it. Even the words "with the intent to embarrass the receivers in the operation of the road," which are here significantly omitted, would make a material difference in the sense, for a lawful and peaceful quitting might "embarrass the Receivers" while not crippling the property. Both the obnoxious injunctions have now been divested of their red-rag qualities. Judge Dundy softened down his by a newspaper interview, and Judge Jenkins has softened his by a formal utterance. In discussing the meaning of the word "strike" Judge Jenkins, according to the reports, said that he never knew of a peaceful strike, and that no strike was ever heard of that was or could be successful unaccompanied by intimidation or violence. This comes pretty near the truth, but yet it is by no means universally true, and the judge recognized the possible exceptions by carefully limiting the terms of his injunction to acts of undisputed illegality.

A Congressional Committee gave hearings at Washington last week on a bill to prohibit ticket brokerage which has been introduced in the lower House. The usual well-known arguments were presented on both sides, and the prospect of putting a stop to scalping seems to be just as good as it has been every day for the past 10 years. As long as unregulated competition exists between the railroads, scalpers are likely to be driven out of business about the same time that we make all pawnbrokers honest. There was one statement made at Washington, however, that ought to go on record for its bland simplicity and lucid accuracy Mr. George McKenzie, of Chicago, a member of the Executive Committee of the American Ticket Brokers' Association, said, according to the report, that "so long as ticket scalping continues, cities of 5,000 and up would not be likely to suffer from discriminations in railroad rates, and so far as passenger traffic is concerned it does away with the necessity for the Interstate Commerce law." The first part of this statement is doubtless true, and in making such a truthful statement which tells such a big lie, the speaker shows himself well qualified for a high place as a competitive traffic man. But although the various cities are thus placed on an equality (probably he said 50,000 instead of 5,000), the different individuals in each city are forced into circumstances outrageously unequal; and in view of this the audacity of the sentiment expressed about the non-necessity of regulation by law is rather extreme even for a man who aspires to be a General Passenger Agent. The ticket broker's prosperity is based not alone on the fact that shrewd travelers are always seeking to get a dollar "off" from the regular price, but also partly on the innate desire of these travelers to get an advantage that other people do not get. Whenever the outside ticket sellers put their business on such a basis that all passengers feel free to patronize them regularly the business will probably die out. Mr. McKenzie estimates that brokers get 30 or 40 per cent. of their tickets direct from the railroads.

The uselessness of the five drawbridges between Spuyten Duyvil and East Albany, and the danger and expense involved in maintaining them, have again been presented to the New York Legislature by the State Railroad Commissioners, and a resolution has been drafted memorializing Congress on the subject. It is to be hoped that the agitation of this matter will be kept up until something is accomplished. The Hudson Division of the New York Central & Hudson River Road is one of the most important passenger railroads in the country, and the question of safety alone would naturally lead to a careful consideration of the subject by a Congress and a state Legislature solicitous for the lives of the people, but for the fact that it looks like a movement to benefit the railroad company. So it is; but it is also a movement for the comfort, convenience and safety of a good many voters. Even with the best bridges, signals and safety appliances, a railroad is "haunted by danger at every foot of its path," and every needless element of danger should be got rid of. But further than this, the railroad company has to bear a constant expense, which is large, to preserve navigators' rights which are very small, and ultimately the public has to pay for this waste, very indirectly perhaps, but it has to pay. The cost of maintaining, working and signalling these bridges, and the delays to trains come back finally to the user's purse or his convenience. Unfortunately this sort of pressure cannot be focussed in votes. Without mentioning the three serious accidents at New Hamburgh, killing two dozen persons—which with the modern improvements in signalling and discipline are not likely to be repeated—it is sufficient to say that a drawbridge is more dangerous than a fixed span, that it involves delays when used, and often some unnecessary delay when not used (by reason of the additional signals, taxing the engineman's attention), and that it is costly to watch and maintain. The first drawbridge north of Spuyten Duyvil, at Croton River, has not been used for several years, and it is said that the filling up of the river has now made it impossible for boats to go in and out. This bridge can be permanently closed without any damage to any one. The next bridge is at Peekskill. This is used considerably, and perhaps it will be impracticable or undesirable to close it. The railroad keeps a day and a night man there throughout the year. But the next bridge, at Fishkill, has not been used for a number of years. As at Croton, the river is practically impassible on account of the mud. The draw at New Hamburgh, we are told, is used to a considerable extent by boats going to the mills located inside the draw at Wappinger's Creek; but it is necessary, we understand, to keep three attendants to watch the bridge, and it would seem as if the cost of this would warrant a considerable effort to replace the river communication by something else. The next drawbridge is on Tivoli bay. It is opened only for a coal boat which goes through about once a year with a load, and returns when it is unloaded. But there is a man at this place day and night. This makes a curious exhibit. Some ten thousand passenger trains a year have to be subjected to inconvenience and possible delay to suit the convenience of a boat making trips once a year, or in the cases of the bridges not so fully moss-covered, a few times a year.

The High-Speed Brake.

Last Tuesday some brake trials were made which, while they disappointed a good many of us, were a step in the development of the high-speed brake. Every one who keeps informed about brake matters knows that the Westinghouse Air Brake Co. has been at work a good while developing the means of using a heavy brake pressure at high speeds, and diminishing it as the speed falls, so as to make use of the fact, long well known, that a brake-shoe pressure which will slide the wheels at low speeds will not slide them at high speeds. The air pressure and the leverages used in general practice are governed by what are now moderate speeds; but there are trains that touch a speed of over 70 miles an hour every day, and 60 miles is very common, and it has come to be extremely important to have an apparatus that will realize, at every stage of application of the brakes, the highest percentage of braked train weight that can be used without sliding the wheels.

It may not be amiss to call attention once more to the communication which Mr. George Westinghouse sent to us in 1892 (see page 697, *Railroad Gazette*, of that year) on the subject of stopping at high speeds. He determined long ago that with brakes in the best possible order, acting on all the wheels, and up to their theoretical efficiency, it is possible to reduce the speed at the rate of three and one-half miles an hour for each second; but "with the brake force now fitted to trains the reduction of speed of trains running over 60 miles an hour would, under favorable conditions, not exceed two miles for each second." Mr. Westinghouse pointed out in that communication that with a *perfect brake*, acting on all the wheels of a train running 90 miles an hour, at the end of ten seconds the train would still be moving at a little over sixty miles an hour and would have traveled 1,130 ft. *But* the 90-miles-an-hour train under the best *actual* conditions of present practice would, at the end of 16 seconds, still be running 61 miles an hour and would have traveled in that time 1,796 ft. In other words 3,000 ft. would be the least possible distance in which a train running at that speed could be stopped, on a level, on a dry rail, with quick action brakes, getting full application at the end of the second second and using 90 per cent. of the weight of the train. Take then a train that sometimes gets up to 80 miles an hour, often to 70, and makes considerable distances at 60. Such trains are to be found running in the United States to-day. Even assuming that you have such a re-enforcement of your braking power that the speed can be reduced at the rate of 2½ miles an hour each second, then the 80-miles-an-hour train would still be running at the end of 15 seconds 42½ miles an hour; the 70-mile train would be running 32½ miles and the 60-mile train would still be running 27½ miles an hour at the end of a quarter of a minute after the effort to stop was made. It does not require much imagination to develop the meaning of these figures.

The Westinghouse Air Brake Co. has been working in two ways to get a re-enforced brake; that is, one in which high pressure can be used at high speeds, reducing itself automatically as the speed falls; and a year and a half ago experiments had shown that a 60-mile-an-hour-train could be stopped, with the re-enforced brake then developed, in from 70 to 75 per cent. of the distance required to make the stop with the best quick-action brake not re-enforced.

One method of re-enforcing has been to raise the pressure in the train pipe, and the other to use a larger brake cylinder. The increased train-pipe pressure is the method that has been tried on the Empire State Express now for a good while, the pressure having been carried up from 70 lbs. to 100, say 43 per cent. In this apparatus an additional valve is used under each car regulating the flow of air from the auxiliary reservoir to the brake cylinder, and it is the function of this valve to control the pressure in such a way that the greater power shall not be got on service application, and so that the greater pressure shall leak off approximately as the speed falls.

The trial which was made on Tuesday was with the increased train-pipe pressure and the pressure release valve. The trial was made by the Pennsylvania Railroad Co., and conducted by its own officers, but a number of the Westinghouse Air Brake people were present as well as representatives of various railroad companies. The trials took place between Ship Road and Downingtown, on the Philadelphia Division, and two trains were used, each train consisting of a class "O" 8-wheel locomotive, weighing with tender about 162,000 lbs. and six coaches each weighing approximately 64,000 lbs. The train fitted with the high speed brake had a brake force nearly as great as the present construction of brakes will stand; that is, about double the force commonly used. The ordinary quick-action brake was used, supplemented by the pressure release valve, and the locomotive had brakes on the front truck wheels as well as driver brakes. On this train, as well as on the other, 14 in. brake cylinders were used. The leverages of the quick-action brake were

so arranged as to use 90 per cent. of the weight of the train, and the levers of the train with the re-enforced brakes were arranged to utilize 180 per cent. of the train weight. The schedule of tests provided for three runs with the two trains on parallel tracks, running side by side, at the same speed, the brakes being applied at the same instant, automatically. Then tests were to be made with the train fitted with the quick action brake only, but using the pressure release valves as well, and increasing the pressure in the train pipe as much as seemed desirable with the existing standard brake gear of the Pennsylvania Railroad. The brake gear on the train with the high-speed apparatus had been very thoroughly remodeled, all the parts being much heavier than existing practice.

The track was very bad, there being a steady but light fall of snow all day, and the high-speed train was run on a freight track, which may perhaps have been more slippery than the passenger track, inasmuch as more oil is dropped along the track from the freight trains. The result of three simultaneous runs was that in every case the train fitted with the quick-action brake stopped in considerably less distance than the train with the re-enforced brake; that is, at 44 miles an hour the stops were in 712 and 890 ft. respectively. At 57½ miles an hour the stops were 1,593 and 1,636; at 59 miles they were 1,323 and 1,454 ft. The run was on a descending grade said to be about 27 ft. to the mile.

It is not worth while to go carefully into the details of pressure, and to reduce the stops to what they would have been on a level, until we have more complete and accurate figures, and at best it is doubtful if the slippery rail would not vitiate the conclusions. Furthermore, it appeared that the sanding apparatus of the high-speed locomotive did not work satisfactorily, and one rail got little or no sand in either of the three trials. Still further, the pressure gages on the locomotive and in the observing car of the quick-action brake train—that is, the train without the re-enforcement—did not correspond by about 10 lbs.; and it is probable that the engineman, instead of carrying 70 lbs. air pressure, as it was intended he should do, carried 80 in the reservoir. At any rate, the fact is that many of the wheels were slid on each of the trains, and on this account stops were really longer than they should have been, on both trains. It is quite possible too, that sliding on the high-speed train began sooner than on the other train. We know, in fact, that some of the wheels did begin to slide immediately on the application of the brakes. Whether or not the wheels would have been slid with a dry rail or a well-sanded rail we need not speculate, but it seems as if one lesson of the trial, and an important one, is that the advantage of great pressure may be entirely lost and may become a positive disadvantage with unfavorable conditions of the rail or with bad handling; that is, with very high pressures it would be hard to avoid sliding the wheels, and of course we all know that with sliding wheels a quick stop cannot be made.

Three of these parallel runs were made, and then two runs were made with the train fitted with the quick-action brake, using also the pressure release valve and using the locomotive with the brakes on the forward truck. The pressure in the reservoir was run up to 100 lbs. The stops were made from 57½ miles in 1,155 ft., and from 62 miles in 1,325 ft., the pressures in the brake cylinder rising to 80 lbs. It will be seen that at a similar speed the 57½ mile an hour stop was 440 ft. better, or say 28 per cent., than the stop made without the pressure release valve and with the lower air pressure. The stop at 62 miles an hour in the latter run was identical in distance with but 6 seconds shorter in time than, the stop from 59 miles an hour in the earlier run.

When we get further figures we shall again consider these trials, and meanwhile the trains will be kept together and the trials continued, and we shall hope to get soon the results of runs under better conditions.

Judge Caldwell's Decision.

United States Judge Caldwell, of the Eighth Circuit, seems to be a somewhat extraordinary judge. His most undignified remarks, such as that Judge Dundy's order was insulting and dangerous, and that the latter order approved of a process which was like hanging a man first and trying him afterward, appear to have been made informally to the reporters or others; but the formal decision revoking the latter's order, which we print, in abstract, on another page, has a very sensational sound, and tends strongly to justify the opinions that people formed of the court and its action on reading the first telegraphic reports of the doings at Omaha. Judge Caldwell's fulsome expressions of friendliness for the employees a month or two ago at St. Louis are now repeated in official form. The tone is unmistakably the same and the words themselves are hardly less gushing.

A large share of the present document is taken up with such utterances as one expects to hear from an advocate of the brotherhoods—about the excellent character of the employees of the Union Pacific, the wrongfulness of compelling men to work like slaves, the incompetency of the Receivers, and the wickedness of paying dividends on watered stock; and these views are what give the general tone to the whole, for the expressions favorable to the Receivers are in the briefest possible language, and anything like an investigation of the wages question is wholly wanting.

The existing wage rates are held to be fair and just, because they have been in force a long time, most of them eight years; and the fact that the earnings of the road fell off from $43,000,000 in 1892 to $37,445,416 in 1893 is not even mentioned, as far as we can discover. Workmen in nearly every other business have suffered very large reductions in their pay since last June, often 20 or 30 per cent.; most railroads have had to reduce wages very seriously, and the Union Pacific itself has reduced (in September) the pay of station men and other classes not banded together; but Judge Caldwell apparently holds that these little incidents should have no weight in considering whether a salary fixed eight years ago ought to be changed now, for he makes no mention of them. The Receivers claimed that wages on the Union Pacific were fully as high as on any neighboring road, and we do not see that Judge Caldwell denies the soundness of the claim.

A reduction in earnings of 20 per cent.* is not, indeed, conclusive evidence that wages ought to be cut down; but when it continues month after month it is a direct warning to the managers to reduce their outgoes in that direction just as far as they possibly can without doing injustice to the employees, and the existence of such a condition of things warrants the owners of the road in expecting a high United States Court to treat the subject in the utmost seriousness. The settlement of such a question demands a thorough and impartial inquiry, but instead of this a "crowded court room" hears something very like a stump speech.

Judge Caldwell hopes that the Receivers will abandon passion and resort to reason; but in referring to the over-capitalization of the Union Pacific he furnishes a striking example of the very infirmity which he is advising them to guard against, for the question of dividends probably does not touch the wages question at all, in any practical sense. The depression in business west of the Missouri has been so serious that the Receivers are under obligation to keep wages down to the lowest reasonable rate in order to keep the road in repair so that it will be safe for trains to run over. The income is in danger of proving inadequate to the purchase of the necessary rails and sleepers and to repairs of cars and engines; if, indeed, the treasury has not already come to that pass. And they would not be warranted in paying any more than a reasonable rate, however favorable the earnings, for their duty to the public who buy tickets and pay freight bills forbids all extravagance.

The conclusions expressed in the foregoing are such as one naturally reaches on reading the decision. To take the extreme opposite view, it might be said that they have to do more with the manner than with the matter of Judge Caldwell's deliverance, and that, after all, he will allow a reduction of wages on "satisfactory proof" that the present rates are unfairly high; and that the receivers have now free opportunity to present such proof. But a press dispatch reports the chief counsel of the road as saying on Sunday that there would probably be no appeal from the decision; and on further examination the incidental statement that "anyone disputing the presumption (that a schedule of wages in force for years is reasonable and just) will be required to overthrow it by satisfactory proof," is the only clause even hinting that a motion for a rehearing will be entertained. We cannot imagine how wages rates that were fair in 1888-92 can be assumed to be fair in 1894 without any more investigation than appears to have been made in this case.

The one important reason given by the judge for such a summary reversal of the Receivers' judgment is that they did not give the employees fair notice of the reduction. But it appears that a notice of some kind was given in October, and the formal notice from the court was issued Jan. 27, 31 days before the reduction went into effect. Certainly, this was time enough; and what was wrong about the manner or style of the notice? The opinion, as reported, does not say. Presumably there was no explicit invitation to the employees to come to headquarters and present their objections. While this may have shown a lack of courtesy, it is difficult to see how it impaired the legal aspect of the matter. Moreover, Judge Dundy says that his language on Jan. 27 was such as to give every employee all necessary encouragement to come into court if he had any complaint to make.

In one of his few paragraphs on the merits of the wages question Judge Caldwell says that the men already participated in the burden imposed by the lack of business. It is not explained how this comes about, but the paragraph must mean that the force of trainmen who work by the trip has not been reduced in proportion to the diminution in the number of trains, and that therefore each man gets pay for fewer trips in a month. But this does not relieve the company in the least. If the men worked only one day each per month the cost of running each train would remain the same. In hard times a railroad may be justified both in its own interest, in retaining efficient and experienced men, and as a slight premium to the men for past faithfulness, in keeping more men than the work actually requires; but the normal way of adjusting the force when business is slack is first to discharge or temporarily "lay off" superfluous men, so that they can be free to make the best possible use of their time elsewhere. True economy requires, when commerce is dull so that we cannot earn a living in transportation or trade, that we devote ourselves to something more directly productive, like planting corn or chopping wood. The Receivers of the Union Pacific are justified in acting according to these fundamental principles. The trouble on most railroads the last six months has been that *both* discharges of men and reductions in pay have had to be resorted to, and probably Judges Caldwell and Riner are the only men of judicial training who credit the claim that the Union Pacific is better off than other roads in this respect.

Concerning the injunction against striking, which was contained in Judge Dundy's order and which aroused such violent criticism at the time it came out, the present opinion merely states that it was out of place to enjoin men from doing things which they already knew would constitute contempt of court. The shallowness of this reasoning is apparent on its surface, and it was sufficiently exposed the very next day in the decision of Judge Jenkins at Milwaukee in the Northern Pacific case. The attorneys made this claim there, and the court replied that punishment fo contempt was not compensation for an injury. A fine for contumacy does not recompense the railroad for loss of business or the public for costly inconvenience. The real ground for criticising the strike injunction was that it seemed to enjoin against lawful as well as unlawful acts.

On the whole this case will serve as an object lesson in the possibilities of Government operation of railroads in America, which thoughtful people will probably find very suggestive. The reader will naturally hope, for the good of our judiciary, that Judge Caldwell has been erroneously reported. If there were any apparent ground for supposing that the receivers had made a mistake—that wages ought to be kept up—we should be glad to hold back the conclusion, which now seems inevitable, that a grave question has been settled by prejudice instead of by reason; but already we hear the natural echo of the utterances at Omaha; a press dispatch from Topeka, "a stronghold of organized labor," is headed:

"BOOMING JUDGE CALDWELL FOR THE PRESIDENCY IN 1896."

The Right to Break Bulk.

The case of the Muncie Pulp Company and others against the Lake Erie & Western Railroad, recently heard before Judge Baker of the United States Circuit Court sitting at Muncie, Ill., presents an interesting question, which, while not altogether novel, cannot be said to be absolutely settled by courts of last resort.

Without going into great detail, it is sufficient to say that the factories of the complainant were connected with the line of the Lake Erie & Western by a short track, which was not, however, owned or controlled by that railroad. By this connecting track loaded cars could be brought from the "Big Four" road at Muncie over the track of the Lake Erie & Western to the complainant's factories, and empty cars taken back, from the works over the Lake Erie & Western track to the Big Four. The Lake Erie & Western had ample terminal facilities to handle all the freight committed to it by the complainants, but declined to receive such freight in the cars of another company or to allow the empty cars of such other company to go to the works of complainant over such portion of its track as made a phy-

*The comparison by years does not show the true extent of the loss as the first half of 1893 was prosperous. In January, 1894, the earnings were $2,272,641, which was $887,351, or 28 per cent., less than for the same month in 1893.

sical unbroken connection with the works. There was no freight traffic agreement between the Lake Erie & Western and the company owning such cars, or offering to the Lake Erie road loaded cars to be hauled by that company over its tracks connecting with the works.

The practical question presented to Judge Baker was whether, under these facts, the complainants were entitled as matter of right, upon tender of a reasonable amount for the services required, to have the Lake Erie & Western receive the cars of such other company, loaded or unloaded, and forward them to or from the works.

Upon the *ex-parte* application, Judge Baker was of opinion that complainants were entitled to this relief and granted a mandatory order compelling the railroad to handle the cars and an injunction preventing it from refusing to receive them. But upon the motion of the railroad company to vacate this order and injunction, the judge had grave doubts whether the complainants were entitled to the relief sought, and accordingly set aside his previous orders.

As we understand his position, he took this course not so much because there was no warrant in any of the authorities for the views of the complainants, but rather because there was better warrant in other and perhaps higher authorities for the contrary views. And under well-settled principles of practice in courts of equity relating to injunctions, where reasonable doubts exist as to his claims, a plaintiff is not awarded an injunction in advance of the final disposition of the case. The rights of the complainants therefore in these cases cannot be finally ascertained until a full examination of the evidence is had upon the trial, but so far as Judge Baker is concerned we apprehend he will adhere to the views last expressed. Their soundness of course may, and probably will, be tested by appeal.

The railroad side of the case apart from any question of technical procedure, in which the laiety are never interested, and yet, alas, so constantly concerned, appeals to every man who owns a railroad bond or share. It is natural and proper that a carrier should wish to get the largest possible yield from its investment, and to run its road with an eye to this result. This is not only proper, but necessary in the long run. It is doubtless true for practical purposes that the largest yield comes to a company when all of its property is in constant use at the highest rates. If it has empty cars, it is more profitable to use them in carrying freight than to use another company's cars for this purpose while its own lie idle. If it has terminal facilities, it is ordinarily more profitable to use them, than some other company's terminal facilities, while its own are unemployed. All this, of course, upon the general principal that property unused is property lost.

It was in this condition that the Lake Erie & Western found itself when confronted by this demand of the factories at Muncie to accept the use of another company's cars and terminal facilities in place of its own, which stood ready for use. Compliance with this demand meant to the railroad not unprofitable business, but business less profitable than it could do in another way. Having reference to the principle of taking care of one's self in the best way one can on a very narrow basis, a fair-minded man could not at the first blush find fault with the railroad for consulting its own welfare, to the exclusion of that of its customers and competitors.

But look at the other side. The factories find their freight in cars locked and sealed, after traveling unmolested many miles, stopped within a couple of miles of their doors, and required to be unloaded for the simple purpose of making it more profitable to the railroad to use its own than somebody else's cars. Of course this means not only delay but expense to the factories, over the cost of uninterrupted transit.

Judge Baker holds it to be the law that when a railroad is provided with abundant facilities of its own, although it has a physical connection with another railroad whereby the cars of its own line may be transferred to the other road, the shipper cannot compel a through shipment from his place upon the line of such railroad to a point on the line of such connecting road unless there is an agreement between the two railroads that if such shippers desire to make such shipment the freight must be transported in cars of the receiving company provided for his use, and at a reasonable charge, from the point of consignment to the connection of the other road; that there the freight shall be transferred from the cars of the receiving road into the cars provided by the connecting road, when it can be carried to points of delivery; or, that upon the reverse, if shipments are made upon one railroad to be delivered upon the line of another railroad, the rail road upon whose line the cars are to be delivered is not required to receive the freight in the cars in which it was delivered by the receiving road, but may furnish its own cars, when the freight may be removed from the cars in which it had been delivered at the connection point, and transported in the cars of the delivering company from the point of connection to the point of delivery.

If this be the law, we cannot but think the law should be changed, at least to the extent of requiring carriers having such connections as exist in this case to make through traffic arrangements on a basis fair to both, and to observe such agreements when made. Such interference with a carrier's affairs would be justified, first by the economic necessity of the case and then by the public obligations which every carrier assumes on the commencement of business. The economic necessity of the case requires the conservation of force, prevention of waste and expedition of delivery. It is a short sighted policy to run a railroad, or anything else, in violation of economic principles. A waste of time and labor is not really profitable even though one is paid for it. It is certainly more profitable to waste time and labor for pay than waste them without pay. But waste of any kind, without pay or with pay, in the long run is harmful to the community as well as to the individual; it violates a great law of economics and cannot long be pursued without disintegration and demoralization. The community is interested, however much we ignore it, in the welfare of each of its members. A carrier is concerned in the prosperous and expeditious conduct of its shippers' business, though this may not be commonly believed. A good barter is a great blessing because each trader surrenders what he don't want and gets what he does want, notwithstanding either rarely considers the other his benefactor.

Having reference to these broad yet simple principles, we take the liberty of advising the Lake Erie & Western speedily to consummate a reasonable traffic agreement with the Big Four, so that the Pulp Company at Muncie may manufacture pulp in the most convenient, expeditious and inexpensive fashion. Do not wait until the law compels you to do it, because that day may not come (if ever) before you have broken the spirit of a valuable customer by harrassing and expensive litigation, or before you have passed through several ruinous foreclosures and reorganizations, which may be traceable in some measure to the policy which you have pursued toward Pulp.

We apprehend Judge Baker's difficulty in finding for the complainant lay in the fact that there was no traffic agreement between the roads that had this physical connection, and the law does not ordinarily make contracts between parties, or cause them to be made, but confines itself to enforcing such as have been already made. Assuming this to be the logic of the decision, one can but justify the court, however much we may regret the result. The reluctance of the ordinary law court to interfere with the internal management of corporations and substitute its judgment for that of the directors in the conduct of business is well known, and sound, and to be preserved rather than weakened.

The many turnstiles of great variety used about Jackson Park, Chicago, during the progress of the World's Columbian Exposition seem to have impressed the importance of this device upon railroad men, and it is being introduced on several railroads. Its use at the suburban stations of the Illinois Central has resulted in much good, or otherwise, as viewed from the standpoint of the railroad or of the patrons of the suburban trains. With the turnstile in use, each passenger must show a ticket when passing to the train. This saves many dollars to the road which otherwise would never be paid by passengers who think that there is nothing wrong in "beating a railroad," or would perhaps enrich dishonest conductors. Suburban passengers object to the turnstile because it sometimes happens that the delay in going through the one or two narrow turnstiles compels one to miss a train. This inconvenience has been considered of sufficient importance to the patrons of the Illinois Central suburban trains to be the cause of threatened action in the courts to compel the railroad company to remove the turnstiles. The suit for such removal was never brought, because the promise to bring it was made for election use, and was forgotten the day after election. The use by the Chicago & Alton of platform gates on its cars in the St. Louis suburban service and elsewhere has had a similar good effect, and the company seems to be putting platform gates on all of its suburban cars. The Lake Street Elevated road in Chicago is the latest to make use of the turnstiles, and on this road each takes the place of a ticket seller. When the road was first put in operation there were at nearly all the stations four employees; a ticket seller and a ticket receiver; for the eastbound track and the same for the westbound. This number seemed necessary because the approaches and exits for the trains eastbound were entirely separate from those of the westbound trains. Recently, however, registering turnstiles have been put in position at those stations at which it is possible to use them, and the number of fare-collecting attendants at such stations has been reduced one-half. The turnstiles are so placed as to be conveniently operated by the attendant from a position commanding a view of the platform. The same attendant opens and closes the exit gates after the arrival of all trains in both directions. At stations where the traffic is light the arrangement causes but little, if any, inconvenience, and the expenses to the company are greatly reduced. Turnstiles have been used in a similar way and under similar conditions on the Kings County Elevated in Brooklyn.

The Senate Committee on Interstate Commerce has made a favorable report on a bill amending the Interstate Commerce Act by eliminating the imprisonment clause for violations and making corporations liable for misdemeanors, and, upon conviction, punishable by a fine of not more than $5,000. It is said that the Committee was practically unanimous in favor of this amendment, and of one or two other desirable ones which are pending, but it does not yet appear that there has been any decided crystallization of opinion on the subject of repealing the anti-pooling law. In the Ohio Legislature a bill has been presented forbidding the construction of freight cars more than 14 ft. high. In the New York Legislature a bill has been presented authorizing the Governor to appoint 17 examiners of locomotive engineers with salaries ranging from $3,500 down to $1,200, the smaller salary applying to "assistant deputies," who must be experienced firemen. It is proposed that engineers pay a fee of $5 for being examined, while hostlers pay only $2. Every reader should be interested in this. An investment of $2 (for the lowest examination) may lead up to the $3,500 salary, if the candidate has patience. A resolution has been introduced in the lower House of Congress calling for an investigation of the action of Governor Tillman, of South Carolina, in seizing railroad property and telegraph offices engaged in interstate commerce. In the recent "liquor war" in South Carolina the Governor ordered the railroads to carry no bodies of men except by his leave, and he exercised a censorship over telegrams. It is said that the railroads disregarded the order addressed to them; but, according to the press dispatches, the transmission of news by wire was for some time impeded.

A very large proportion of European Russia, in fact, all north of the latitude of St. Petersburg (60°) and nearly 150 miles further south is entirely destitute of railroads; and has no considerable river communication with the rest of the country. This northern territory is, it is true, much more thinly peopled than the country further south, but it contains, nevertheless, several millions of people, who are liable to great suffering when local crops are short, however, great their resources may be, from simple inability to bring in the grain which they are able to pay for. There was a serious famine there 25 years ago. There is now talk of building a railroad through it and the project was discussed at some length in our issue of March 23, p. 209. Three routes are discussed, in parts far distant from each other: one from the terminus of a railroad about 275 miles north of Moscow, and north 350 miles to Archangel, or the White Sea at the mouth of the Dwina, near the 65th degree of latitude—that is as far north as the *north* end of Hudson's Bay; another farther east from navigable water on the Dwina further south to navigable water on a branch of the Volga; and a third from the northern end of the Gulf of Bothnia, in Finland, eastward, which would be wholly near the latitude of Archangel. The matter is under serious consideration by the government, and it is hoped that a route will be selected in time to begin surveys this season.

The army of tramps commanded by Coxey had got as far as Uniontown, Pa., at last accounts. They seem to have kept clear of the railroads thus far. Fry's army, which came from California by way of Texas and St. Louis, had reached Highland, Ill., on April 10, but the number had become reduced to about 300. It appears that the railroads at East St. Louis all maintained a close watch, and the tramps did not try to ride on the cars. The railroad officers told the local authorities at East St. Louis that municipal officers in the principal Eastern cities had formally warned the railroads not to bring paupers into their territory. An "industrial army" of 250 is reported as camping at Riverside, Cal., where it "will remain until it can make arrangements to ride in box cars to Topeka." They propose to pay for this transportation, but the size of their offer is not stated. Dispatches from Ogden, Utah, on Tuesday, reported the arrival there of an "industrial army" filling 27 box cars; and an order was issued by a local court commanding the Southern Pacific to get the vagrants out of Utah as soon as possible. Apparently this band is the one that started from San Francisco last week.

NEW PUBLICATIONS.

Journal of the Association of Engineering Societies. January, 1894. John C. Trautwine, Jr., Secretary of the Association, Franklin Institute Building, Philadelphia. Per year $3, per number 30 cents.

The January issue of the *Journal* contains a good portrait of the late James B. Francis and a Memoir by a committee of the Boston Society. It contains also a Memoir of Mr. A. W. Locke by a committee of the same society. The papers are: Landslides, by David Molitor; Water Supplies by Wynkoop Kierstead, and A New Prismatic Stadia, by Robert H. Richards. The new editor has added what he calls a "contribution box," being a department for notes from members of the societies and others. This, he says, is designed, like the contribution box in the churches, "for the receipts of such further and minor contributions as members or the strangers that are within the gates may feel disposed to make." Another department is "the library," containing brief reviews of new books. Both of these, we should suppose, will be valuable and interesting innovations.

Transactions of the American Institute of Electrical Engineers. Vol. 10, 1893. Ralph W. Pope, Secretary, 12 West Thirty-first street, New York City.

We mention this book merely to inform the reader that it is now issued and where it may be had. It is an octavo of 720 pages containing the records of the meetings of the Institute for the year 1893. There are nearly 25 papers, with discussions thereon, besides reports of committees and other information.

TRADE CATALOGUES.

The Westinghouse Air Brake, 1894. *Second edition.*—The Westinghouse Air Brake Company sends us the latest edition of the 1894 catalogue, the character of which is, of course, well known to all who are interested in brakes and train signaling apparatus.

The *Boiler Maker* is a monthly journal sent out by Joseph T. Ryerson & Sons, boilermakers, of Chicago. It contains in each issue short essays on boiler construction, trade notes and useful data about boiler material. This firm has recently been appointed sole Western agent for the corrugated furnaces for boilers made under the Fox patent by the Continental Iron Works, of Brooklyn, N. Y.

Union Pacific Wages Not Reduced.

Judge Caldwell—Judge Riner concurring—delivered the opinion in the wages question of the Union Pacific employees at Omaha, April 5. The enginemen and others had appealed to the Circuit Court against the reduction of pay ordered by the receivers of the road, and approved by Judge Dundy of the District Court, and Judge Caldwell now reverses Judge Dundy's order. There seems to be nothing to prevent the receivers from making new arguments before the court to prove that wages ought to be reduced, the main point of the order being that the receivers ordered the reduction without first giving the employees a reasonable time in which to make objections. The principal points of the decision are as follows:

The relation of these men to the company and their rate of wages were determined in the main by certain regulations, and schedules, some of which had been in force for more than a quarter of a century, and all of which had been in force substantially as they stand to-day, for a period of eight years and more. These regulations were the result of free and voluntary conferences. The labor organizations had become established institutions on the system long before the appointment of the receivers. Two of the ablest managers, S. H. H. Clark and Edward Dickinson, testify that these labor organizations on this system had improved the morals and efficiency of the men, and had rendered valuable aid to the company in perfecting and putting into force the rules and regulations. . . . Among the regulations was one to the effect that no change should be made in the rules and regulations and the rate of wages without first giving to the labor organizations 30 days' notice, or other reasonable notice.

An agreement has been reached with the train dispatchers and operators which has been reported to the court and confirmed. This was one of the most difficult schedules in the whole list to adjust, and the satisfactory agreement reached by the conference shows the great value of good-tempered, calm, and intelligent inquiry, in which both sides are represented, and in which both sides learned, perhaps for the first time, the ground on which the demand is made by the one and resisted by the other.

The receivers had declared to the court that after careful consideration of the matter and consultaion with the managing officials of the Union Pacific system, they were of the opinion that the so called rules, regulations, and schedules of pay for train dispatchers and operators were entirely unnecessary. And yet at the conference held under the order of the Circuit Judges the position assumed by the receivers in their petition to the court was found to be untenable and was abandoned, and rules and regulations governing telegraphers' wages adopted.

When a road comes under the management of a court in which the employees are conceded to be experienced and capable, the court will not, upon light and trivial grounds, dispense with their services or reduce their wages. And when the schedule of wages in force at the time the court assumes the management of the road is the result of a mutual agreement between the company and the employees which has been in force for years, the court will presume the schedule is reasonable, and just, and any one disputing that presumption will be required to overthrow it by satisfactory proof. This the court contends has not been done by the receivers, although they had all recommended that a cut be made. It is the court's belief that the receivers made the request ignorantly, as only one of them is a practical railroad man, and their opinions upon the wage schedules are confessedly of little value. The court shares in their anxiety to have an economical administration of this trust to the end that those that own the property and have liens upon it may get out of it what is fairly their due. But to accomplish this desirable result the wages of the men must not be reduced below a reasonable and just compensation for their services. They must be paid fair wages, though no dividends are paid on the stock and no interest paid on the bonds.

It is a part of the public history of the country, of which the court will take judicial notice, that for the first $36,000,000 of stock issued this company received less than two cents on the dollar, and the profit of construction represented by outstanding bonds was $43,929,328. There would seem to be no equity in reducing the wages of employees below what is reasonable and just in order to pay dividends on stock and interest on bonds of this character.

The recommendations of the receivers to adopt their schedules cannot be accepted by the court for another reason. That schedule was adopted without affording to the men or their representatives any opportunity to be heard. The receivers were the first to break the contract between the court and its employees. . . . The period of compulsory personal service, save as a punishment for crime, has passed in this country. In this country it is not unlawful for employees to associate, consult, and confer together with a view to maintain or increase their wages by lawful and peaceful means, any more than it was unlawful for the receivers to counsel and confer together for the purpose of reducing their wages.

A system of regulations by which the company has been able to bring into its service the class of men who have appeared before the court at this hearing is certainly commendable, and meets the entire approval of this court. In the opinion of the court the allowances made by the schedules now in force are just and equitable. The employees under the present system share the burdens of diminished business when property is in the custody of receivers.

The law declares it to be a contempt of the court appointing them for any person to interfere with the property or with the men in their employ. No injunction order can make such unlawful interference any more of a contempt than the law makes it without such order. Such orders have an injurious tendency, because they tend to create the impression among men that it is not an offense to interfere with property in possession of receivers or with the men in their employ unless they have been especially enjoined from so doing.

In conclusion Judge Caldwell says: "We may hope that in future differences about wages between courts and their employees, resort may be had to reason and not to passion." . . .

In connection with the opinion, Judge Caldwell made an order approving certain amendments in the rules governing enginemen. These covered slight compromises as to overtime and pay for short runs, which had been agreed upon between the General Manager and the Grievance Committee.

On April 6 the American Railway Union applied to the District Court (Judge Dundy) to have the wages of its members restored to the rates in effect previous to last September. This organization evidently acts for Union Pacific station men and others whose pay was reduced 5 per cent. and who make the present claim on the strength of Judge Caldwell's decision concerning the other classes of employees. Judge Dundy gave the attorneys a favorable reply, but said that he should have to postpone a hearing until the General Manager could come into court. The reports state that the Judge exhibited considerable feeling, complaining that Judge Caldwell had rebuked him for following the example of Judge Jenkins in the Northern Pacific case, though his order was less stringent than Jenkins'. He told the men that, if they had been wronged by the reduction, the wrong should be righted, and "they would not have to join any union to get a hearing." He referred to the fact that his order in the Union Pacific case was made on Jan. 27, more than a month before the proposed reduction was to go into effect, and that the employees were granted the right to come into court if they felt aggrieved.

On April 10 the salaries of the clerks and other employees affected by the reduction which went into effect Sept. 1 were ordered restored. General Manager Dickinson said that he so recommended solely on the ground of justice. He could not do otherwise after the statement which he made when being examined by Judge Caldwell.

Judge Jenkins, at Milwaukee, on April 6, made a slight modification of his order forbidding the Northern Pacific employees to strike. The application for this modification had been made by Mr. Arthur and other brotherhood chiefs, and the judge simply expunged from the order the clause which more particularly affected them, to wit: That which restrained them "from ordering, recommending, approving or advising others to quit the service of the Receivers of the Northern Pacific on Jan. 1, 1894, or at any other time." In all other respects the judge denies the motion.

The Rules of Interchange.

The committee appointed at the February meeting of the Western Railway Club to recommend changes in or additions to the Rules of Interchange, and consisting of Peter H. Peck, R. D. Smith and J. Townsend, presented the following after a careful consideration of the changes and suggestions made by the heads of car departments of the railroads centering in Chicago:

The Committee express a belief that as few changes should be made in the Rules of Interchange as possible, and what few are made should be in the direction of reducing their volume rather than to increase them.

Rule 3, *Section P.*—The Committee recommend that 3 in. be shown as the limit of journal for axles under 20,000-lbs. capacity cars, instead of 2¾ in. as now shown. It is believed that a 3-in. journal is as small as ought to be allowed to run at the present time.

Rule 3, *Section R.*—The Committee recommend making this rule read "out of gage, or wheels that measure less than 4 ft. 5⅛ in. or more than 4 ft. 5⅝ in. between flanges, or less than 5 ft. 4 in. over treads."

Rule 3, *Section S.*—The Committee recommend that paragraphs 1 to 16 inclusive be omitted.

Rule 3, *Section U.*—The Committee recommend that paragraphs 1, A, B, C, D, E, F, G, H, 2, 3, 4, 5, 6, 7 and 10 be omitted.

Rule 3.—The Committee recommend omitting sections Y 2 to Y 5, inclusive.

Rule 8.—Your Committee were urged to recommend adding three more sections to Rule 8, but are not ready to make any recommendations in regard to adding the sections as suggested, but think that the subject is worthy of discussion by the Club. As suggested, it would read, Rule 8, add:

Section (F)—Oil box covers lost off when not caused by wreck or breakage due to rough usage.

Section (G)—M. C. B. knuckles worn out.

Section (H)—Air hose burst or worn out.

Rule 12.—The Committee recommend that the following paragraph be added to this rule: "In case the owner of a car removes an axle on account of defective wheels, the road responsible for damaging the wheels shall not be charged for any difference in value between the axle used and that removed."

After Rule 20.—The Committee recommend that a rule be inserted: "A railroad company shall not be held responsible for wrong repairs not made by it on cars passing over its lines to the owners, if the wrong repairs are of such a nature as to render it impossible for inspectors to discover or know that such repairs did not conform to the requirements of Rule 15."

The addition of the above rule was thought by the Committee to cover a number of suggestions bearing on this point that had been brought up in the answers to the Committee, and it is recommended for discussion.

Rule 23.—The Committee recommend adding to this rule the following table, for convenient reference in figuring depreciation:

TABLE FOR FIGURING 6 PER CENT. DEPRECIATION PER ANNUM.

1st year	.06	7th year	.3515
2nd "	.1164	8th "	.3994
3rd "	.1694	9th "	.42698
4th "	.21924	10th "	.46136
5th "	.26608	11th "	.49368
6th "	.31012	12th "	.52406

Multiply the value by the per cent., point off, and the result will be the amount of depreciation, which deduct from value to get the present value.

Rule 26.—The Committee would recommend that an arbitary price be established for M. C. B. couplers and knuckles in interchange, less scrap; and we recommend that such price be $4 for couplers, and $1 for knuckles.

Railroad Matters in Chicago.

Freight Traffic.—Officers complain that inbound business is very quiet, but a comparison of the reports of the Board of Trade with those for corresponding periods in preceding years fails to show a material shrinkage in the volume of any class of inbound traffic of the leading granger roads. The deliveries of grain by the eleven lines during the past week aggregated 3,294,000 bushels compared with 2,807,000 bushels the first week of the current month last year, and 2,392,000 bushels the same time in 1892. There was a good increase in flour and miscellaneous produce traffic, and a large gain in live stock; the deliveries by ten leading roads being 57,500 head of cattle, 142,300 hogs, and 57,300 sheep, compared with 56,000 head of cattle, 61,215 hogs and 53,628 sheep in 1893. The increase was surprising, considering the low prices. The reports of grain and live stock deliveries at other prominent Western markets by Chicago roads also make a better showing than at the same time in recent years. The situation in other directions seems equally favorable: the shipments of merchandise to the country being well up to the same time last year. The prospects for a continued average spring business in out freights are also fair, the chief uneasiness being the increasing labor trouble.

The deliveries of grain at Chicago by the leading Western railroads for the week ending April 7 and the corresponding time the two preceding years compare as follows:

	1894.	1893.	1892.
C. & N. West	922,000	539,000	256,000
Ill. Cent.	359,000	371,000	628,000
C., R. I. & P.	437,009	29,000	325,000
C., B. & Q.	451,000	1,127,000	408,000
C. & Alton	106,000	29,000	67,000
C. & E. Ill.	36,000	80,000	54,000
C., M. & St. P.	568,000	297,000	403,000
Wabash	170,000	26,000	19,000
C. & G. W.	64,000	191,000	86,000
A., T. & S. Fe	170,000	114,000	144,000
L., N. A. & C.	8,000	1,000	2,000
Totals	3,294,000	2,807,000	2,392,000

The following shows the deliveries of flour (barrels) at Chicago by the leading Western railroads for the week ending April 7, and for the corresponding time the two preceding years:

	1894.	1893.	1892.
C. & N. West	24,283	18,542	33,020
Ill. Cent.		1,350	1,885
C., R. I. & P.	16,891	1,500	3,850
C., B. & Quincy	5,551	12,319	16,195
C. & Alton	1,950	450	1,475
C. E. & Ill.	450		125
C., M. & St. P.	70,750	22,951	20,375
Wabash	300	916	940
C. & G. W.	18,498	11,796	23,363
A., T. & S. Fe		300	294
L., N. A. & C.			
Totals	138,673	70,123	102,522

The shipments of livestock from Chicago by the eastbound railroads for the month of March for the past four years were as follows (carloads):

	1894.	1893.	1892.	1891.
B. & O.	535	493	909	728
C. & Grd. Tr.	1,599	1,129	1,296	1,330
C. & Erie	617	196	264	427
L. S. & M. S	2,130	2,108	2,458	2,364
Mich. Cent.	440	801	797	629
N. Y., C. & St. L.	267	362	1,755	2,030
P. C. C. & St. L.	134	152	209	138
P., Ft. W. & C.	1,381	1,184	1,526	1,574
Total	7,103	6,425	9,214	9,220

The deliveries of livestock at Chicago by all railroads for the month of March, and the corresponding time the three preceding years, are as follows :

	1894.	1893.	1892	1891.
A., T. & S. Fe	765	683	1,115	984
B. & O.	11	7	12	8
C. & Alton	1,282	1,697	1,180	1,062
C., B. & Q.	5,110	4,184	5,512	6,273
C. & Erie	11	10	10	4
C. & E. Ill.	220	217	269	263
C. & Gd. Tr.	8	18	8	9
C., M. & St. P.	3,807	3,332	3,888	3,751
C. & N. W.	5,423	4,920	5,987	6,424
C., R. I. & P.	2,616	1,871	2,913	2,741
C. & G. W.	712	632	929	1,114
Ill. Cent.	2,290	1,563	2,285	2,479
L., S. & M. S.	30	44	13	18
L., N. A. & C.	4	53	65	61
Mich. Cent.	22	37	20	11
N. Y., C. & St. L.	10	16	6	11
P. C. C. & St. L.	26	41	32	41
P., Ft. W. & C.	20	25	17	17
Wabash	917	1,207	705	913
Wis. Cent.	215	141	113	89
Total cars	23,539	20,758	25,075	26,272

Passenger Traffic.—The improved weather was favorable to passenger traffic and the majority of the railroads reported gain in both local and through travel. The officials complain, however, that the general volume will show a considerable decrease, and agree that a further weekly shrinkage in business is certain as the season advances. "We are not," said a general manager, "encouraged at the business outlook from now until autumn. It is true that the volume of freight is fair, and the prospects reasonably good, but the attitude which labor organizations are assuming in all parts of the country, and the disposition of employees to not only demand a higher scale of wages than the demand for work justifies, but in a majority of cases to dictate conditions under which the establishments in which they are employed shall be managed, are calculated to deter capital from new undertakings and render manufacturers who have recently reopened their factories exceedingly conservative in their conduct, if it does not compel them to again close.

Track and Equipment.—The railroads are not placing more than a fractional percentage of orders for rails, compared with the average at this date. The managers of the leading Western lines, in view of the uncertainties regarding earnings, are disposed to buy rails only as they are needed. Orders for rolling stock are also very light. There is, however, an increased activity in the repair shops, and some of the large manufacturers of car and locomotive supplies report increased orders for such materials from Chicago and interior railroads. So far as can be learned the interior roads are also conservative in their purchases of track materials and equipments. The mills say their orders for rails from that source are limited and mainly conditional. It is reported, however, that more inquiries for freight cars are coming from that direction, but they are mainly from roads that are in the hands of receivers. In most cases these lines were small buyers last year, and now find their equipment in low condition.

CHICAGO, April 9.

The Missouri River.[1]

BY O. B. GUNN, C. E.

(*Continued from page 246.*)

NAVIGATION.

The Missouri River, before the advent of the railroad, was the main avenue of commerce into the interior of the State, as well as to all the great region lying west of it to the Pacific Ocean, and in early times all the freight to and from this vast area, then an almost unbroken wilderness, found its way by steamboat from New Orleans, Pittsburgh and St. Louis, to the various villages and landings, the most convenient for shipping into the interior. Up to the date of the opening of the territories of Kansas and Nebraska to settlement, in 1854, St. Joseph and Council Bluffs were the extreme posts for outfitting and shipping into the interior, and for making up caravans of freighters and fortune hunters, for Salt Lake and California, while government steamers took supplies to the several small military posts, far up the river. Kansas City, then known as Westport Landing, was the shipping point for the great southwest, including Kansas, the Indian Territory, New Mexico, Arizona and southern California.

[1] Extracts from a paper read before the Engineer's Club of Kansas City, March 12, 1894.

The early Missouri River steamboats had many perils to encounter, but to offset this they had a monopoly of transportation, and were able to charge such high rates as to make their business very profitable and keep a large fleet of vessels constantly employed. They had three mortal enemies, fire, steam and the fatal "snag," which lies hidden beneath the surface of the water deep enough to escape the ever watchful eye of the vigilant pilot. There are no records available to show which of these enemies claims the most victims, but it is probable that at least one-half of the steamboats that once navigated this river have at one time or another been "burned to the water's edge," "blown up," or "snagged."

The passage of the Kansas and Nebraska bill opening those great territories to settlement, in 1854, converted all the territory adjacent to the river into a state of great political excitement, and it soon became the political and military battle ground of the slavery and anti-slavery parties, and Kansas City became the center of border warfare. The excitement produced a great immigration into the disputed region. New towns along the river sprang into existence and notoriety. Wyandott, Leavenworth and Atchison, in Kansas, and Nebraska City and Omaha, in Nebraska, were the most prominent, while many interior towns were also started. This great movement of people in search of homes, and politicians looking for place and profit, caused an immense immigration, and the river fairly swarmed with steamboats loaded with passengers and freight of all kinds required by a rapidly increasing population. Kansas City reaped the full benefit of this great immigration.

In 1857 the halcyon days of the Missouri River steamboat reached the climax. The financial panic of that year caused the tidal wave of immigration to turn backward, and with this backward tide began the decadence of steamboating on the Missouri River. Disasters of various kinds fell upon the new settlers, and the great drouth of 1860 caused every one to leave the new territories, who could raise money enough to leave the country.

The Hannibal & St. Joseph Railroad was completed to St. Joseph in 1858, and soon thereafter to Atchison. The opening of the new route immediately caused a great diminution in the steamboat traffic. The railroad company put on a daily steamboat line from Kansas City to Atchison, and much of the freight and most of the passengers came and went by this new and much quicker route. The great civil war from 1861 to 1865 farther depleted the commerce of the river, and the completion of the Missouri Pacific Railway to Kansas City in 1865, and to Leavenworth in 1866, and the construction of the railroad from St. Joseph to Council Bluffs soon thereafter, completed the destruction of the river commerce.

One by one, the steamboats finding the traffic no longer profitable, stole silently away and sought other fields and pastures new, and the places that once knew them will know them no more forever. And with the decay of the river commerce went the decay of the Missour river towns between St. Joseph and St. Louis. The Kansas and Nebraska towns have fared much better than the Missouri towns, principally because their railroads run back from the river and bring trade to them, instead of taking it away. The very causes which have ruined many of the river towns and dissipated their trade, have gathered it up and brought it to Kansas City, and materially helped to build it up into a great business mart.

The Missouri River steamboats now have great obstacles to contend with in handling freight in competition with the railroads, which now reach every point worth reaching. Two lines of railroad now practically parallel the Missouri River, all the way from the mouth to Sioux City, a distance by river of 818 miles. Most of the way these railroad lines lie directly in the valley, where they have nearly level grades, and shorten the river distance nearly 50 per cent., and where they do not lie in the valley proper, they are but a few miles back from the river, so that every town and village along the river may be said to have all necessary railroad facilities. Above Sioux City every important point has one or more railroad lines leading directly to Chicago and the East. The Northern Pacific occupies the greater portion of the valley of the Yellowstone, while the Great Northern takes the Upper Missouri Valley, and these roads lead directly to Minneapolis, St. Paul, Duluth and the navigation of the Great Lakes, so that every point along the river, from its mouth to its head, is supplied with the best of modern railroad facilities. From Chicago to Omaha the distance by rail is 500 miles and only 42 miles farther than from Chicago to Kansas city. From Chicago to Sioux City is 517 miles and only 59 miles farther than from Chicago to Kansas City, but these extra distances are abolished by the rrilroads making making the freight rates just the same to these points and all Missouri River points between Kansas City and Sioux City. To ship freight from Chicago to Omaha by rail will take, say four days, with no insurance commissions or transfer expenses to pay, while to ship from Chicago to St. Louis by rail, 280 miles, then transfer to steamboat with commission, insurance, etc., to pay, then a long and tedious trip up the river 658 miles to Omaha, and 818 miles to Sioux City, occupying three weeks or more of time in transit from Chicago, precludes the possibility of such a route becoming popular or successful, and the same conditions apply to St. Joseph, Nebraska City, Sioux City and other river points.

While at Kansas City the Missouri River comes down from the north, and cuts all the east and west lines of railroads, here it turns directly east in its general direction, its mouth being nearly due east of us, and practically parallels the east and west lines of traffic, so that the conditions for successful navigation from this point east are much more favorable than from this point north. But the route from Kansas City to St. Louis is too short, the railroad stations too numerous, and our commercial relations with St. Louis too limited, to make it profitable. The distance from here to St. Louis, by river, is 48 per cent. longer than by rail, and within 56 miles of the distance by rail from here to Chicago. Freight is four times as long in transit. Trans-shipment from rail to steamer, and vice versa, must be paid for, as well as storage and commission. Another large item of expense is insurance on vessel and cargo, which, owing to the perils of navigation, as hereinbefore mentioned, is very high. The dangers from fire, steam explosion, snags and bridge piers, and grounding upon shoals, are in the aggregate so great that no boat owners would care to risk their craft for a single trip without insurance. Then the activity and suavity of the omnipresent railroad agent, who under the Interstate Commerce law is allowed to make competing rates where water commerce is a competing factor, are so irresistible that a Kansas City merchant must be a stalwart indeed, in view of all these obstacles and drawbacks, if he gives the steamboat line his full support, even, if by so doing, he is patronizing a home institution which strongly appeals to his local pride, and without his patronage cannot possibly prove successful.

The late loss by snagging, in the Mississippi River, of the A. L. Mason, a steamboat built with two others expressly to run between Kansas City and St. Louis during the navigable season, is a graphic illustration of the dangers to steamboats from this cause, and it was the last of the trio, the other two having been sold on account of lack of patronage.

The conditions of railroad transportation are now so favorable as to time, distance and low rates, that Missouri River navigation above Kansas City can never again be successful, and it is not likely that any attempt will ever again be made in that direction; but it is by no means certain that active navigation will not again be resumed after awhile from Kansas City to the mouth of the river.

RIVER IMPROVEMENTS.

But little progress has thus far been made in river improvements, although Congressional appropriations to the amount of about three millions of dollars have already been made and expended, and the several railroad companies interested have probably expended another million of dollars. These appropriations have been expended upon stretches of river, very far apart, and in a desultory way, and largely, and properly, too, in protecting the main commercial cities along its banks from dangerous inroads from the river and consequent changes in the channel. The channel, from causes heretofore mentioned, is exceedingly difficult to maintain within fixed limits.

To illustrate: A few years ago the current attacked the "Kaw Bend," from one to three miles above the Hannibal & St. Joseph Railroad bridge, with great vigor. It pressed toward the Council Bluffs railroad tracks so vigorously that the utmost efforts of the railroad company were required to stop the encroachments, and many hundred carloads of rock were deposited along the river bank to prevent the railroad track from being engulfed. The government forces took charge of this bend, sloped the banks, covered them with woven mattresses of brush, sunk them along the slopes and covered them with broken rock. While this was being done, a long, low sand bar began to form a few hundred feet from the shore. That sand bar has now grown into such magnitude as to be called "Grand Island." It is covered with a thick growth of willows and young cottonwoods, and five years ago it was opened as a pleasure resort, a small steamer plying between it and the city for some time. The main channel of the river, brought to bay by the ripraps, and baffled in its encroachments, has changed its course, and now flows beyond the sand bar island, a half mile or more from its former bed, which at present is entirely dry, and filled up with sand several feet above low-water mark. With this change came a straightening of the main channel and a shortening of the curve arouud Kaw Point, and thence to the Hannibal Railroad Bridge. The current was retarded in front of Kansas City, Kan., and around the ripraps in front of the packing-houses, and sand and sediment was rapidly deposited, and now we see two or three hundred acres of partly reclaimed land added to the city, where five years ago was the channel of the river. This land, if the river bounds are held where they now are, will become valuable when fully reclaimed, and every acre now, even in its inchoate state, is worth several thousand dollars. If those interested in its ownership will see that the channel above Kaw Point is maintained where it now is, they can rest secure in their new possessions by revetting and ripraping the newly formed shore. If, however, the channel returns to its old bed around Kaw Bend, all the reclaimed land will

disappear, and the current will again sweep along the packing-house ripraps. . . .

Again, opposite Doniphan, a few miles above Atchison, in the June rise of 1892, a bend of the river was cut across, and the river thereby shortened four and a half miles, and a new channel formed. The water at the head of the new channel was about 40 in. higher than at the lower end, which caused a great rush of water, when the cut-off was finally accomplished. This 40 in. would doubtless affect the velocity of the current for 10 and perhaps 20 miles above and below the cut-off. The impetus given to the current reached several miles below to Atchison, where it did great damage to the government works, and nearly destroyed them. . . . The sudden increase in the flow of the current washed away the government works at Atchison, cut away much valuable land, and threatened the east end of the Atchison Bridge; this contingency could not reasonably be expected nor provided for by the engineers, as it was entirely unlooked for and unexpected.

Again, at Omaha, what is known as East Omaha was once largely a part of Pottawatomie County, Iowa. Most of it was comprised in a big bend of the river and the old channels of the river, and included several hundred acres of land. This was cut off by the action of the river from Iowa, during the June flood of 1877, and added to Nebraska, the old channel being gradually filled up, and parts of it turned into a marshy lake. Enterprising citizens of Omaha secured title to all this and adjoining lands, filled up the old beds of the river, laid it off into streets, alleys and railroad tracks, and are constructing a railroad bridge across the river to connect with the railroad system on the Iowa side of the river at Council Bluffs. The state line between the two states having been ordained many years ago by Congress to be the center of the channel of the river as it then existed, the interesting question arises, Where is the state line now? Is it fixed, or does it travel back and forth with the ever, changing channel? A large part of East Omaha prior to 1877 belonged to and was a part of Iowa, and was taxed by Iowa officials for state and county purposes. What authority has Iowa to cease taxing it, and Nebraska to begin taxing it? This interesting and intricate question was settled by the Supreme Court of the United States in the case of State of Iowa vs. State of Nebraska, in which it was decided that this was a case of "evulsion," or the forcible separation or cutting off of a part of the State of Iowa by the action of the river, making an entirely new channel, and that the part cut off still belonged to Iowa; but if the same change in the channel had occurred gradually and entirely by erosion, or the gradual washing of the Iowa side, and consequent accretions upon the Nebraska side, that the middle of the channel would still be the boundary line. Under this decision a part of East Omaha lying on the Nebraska side of the river still belongs to Iowa. This settles the legal question, but it still leaves an equally important question for the engineer to settle, and that is to find where the middle of the old channel, now filled up, graded and laid out into blocks and streets, was, so as to accarately define the line between the states. If not already done, this could be accomplished by the legislation of the two states selecting an engineer from each state to survey and agree upon and define the line of boundary.

This cut-off in 1877, and the cut-off at Doniphan in 1892, show plainly enough that state lines, wherever it is possible, should be fixed upon solid ground, where permanent monuments can be established, and the exact line be produced at any time. No mortal man can tell whether a single mile of the middle of the Missouri River is where it was 40 years ago, but we do know absolutely that the most of the channel of the river between those states is changed, thus making an ever-changing boundary line between great states. . . .

From these characteristic examples it can readily be seen how difficult is the task of controlling the channel of this treacherous stream, and how necessary it is that improvement works should be of the right kind, and be made at the right time and place, and what vast sums of money will be required to improve and permanently rectify and deepen the navigation channel. The efforts of the River Commission should hereafter be directed to removing the most troublesome sand bars between Kansas City and the mouth of the river. Indeed, the expenditure of any more money in an attempt to improve the navigation of the river above Kansas City is foolish in the extreme, because there is no navigation above this city, and never again can be. During the year 1893 the draw of the Atchison Bridge was opened 32 times, 31 of which were to pass government steamboats, engaged in river improvements, and only once for a commercial steamboat, and that a small tramp boat, bound for the upper river. The cost of opening the Atchison drawbridge 32 times in 1893 by hand was $55.85, or $1.75 each time. The Kansas City draw was opened only 15 times in 1893, and every time for a government improvement boat. The small tramp boat for which the drawbridge was opened at Atchison, if it passed here at all, was so small that it passed under the draw without opening it.

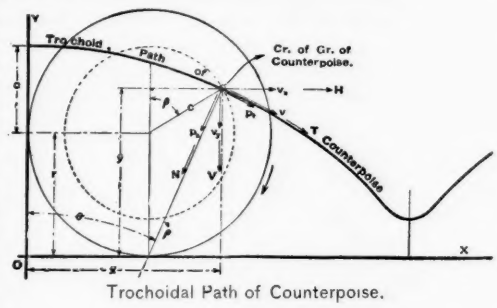
The river is probably in as good boating condition now as it was 37 years ago, when steamboating was at its climax. What is the reason that navigation has gone entirely into decadence above Kansas City? Because it will not pay, and cannot be made to pay. That settles the whole question. A merchant of St. Joseph would possess but little business sense who, when he can get his goods from Chicago in three days by rail, would ship more than half the distance by rail and then transfer to steamer at St. Louis, with all the attendant cost and delay, and have his goods two weeks in transit, instead of three days by rail. And the farther up the river you go, the greater the advantage to the railroads, and the greater the disadvantage to the steamboats.

(To be continued.)

The Problem of the Counterbalance.

To explode the theories urged that the conditions are very different when the driving wheel runs upon a track, from those attending the Purdue University experiments (reported in our issue of Dec. 15, 1893), and those under which Mr. R. A. Parke, M. E., treated the subject in his recent paper before the New York Railroad Club (page 136, *Railroad Gazette*); Mr. Parke sends us two mathematical proofs. The longer one is given below, the briefer one being too analytical for many readers.

The effect of the counterweight as it travels in its trochoidal path is determined, as we suggested might be done, and the same result is obtained as is given in the paper where the counterweight was treated as following the path of a circle with reference to the locomotive.



Trochoidal Path of Counterpoise.

In the accompanying figure let r = the radius of the wheel.

Let c = the distance of the center of gravity of counterpoise from center of wheel.

Let ω = the constant angular velocity of wheel.

At a given instant, the wheel has rotated through an angle $\beta = \omega t$.

The co-ordinates of the center of gravity of the counterpoise, at the instant, are

$$y = r + c\cos\beta = r + c\cos\omega t \qquad (1)$$

$$x = r\beta + c\sin\beta = r\omega t + c\sin\omega t. \qquad (2)$$

Or $y = r\left(1 + \frac{c}{r}\cos\omega t\right)$ and $x = r\left(\omega t + \frac{c}{r}\sin\omega t\right)$

which is the general equation of a trochoid. If $\frac{c}{r} = 1$, the trochoid becomes a cycloid; if $\frac{c}{r}$ be greater than 1, it becomes a curtate cycloid; if $\frac{c}{r}$ be less than 1 it becomes a prolate cycloid, the last being the path of the crank pin or counterpoise of a locomotive driver, shown in the figure.

The vertical component of the velocity of the counterpoise is:

$$v_y = \frac{dy}{dt} = -\omega c\sin\omega t = -\omega c\sin\beta;$$

and the horizontal component is:

$$v_x = \frac{dx}{dt} = \omega r + \omega c\cos\omega t = \omega(r + c\cos\beta).$$

Whence the velocity of the center of gravity of the counterpoise along its path is—

$$v = \sqrt{v_y^2 + v_x^2} = \omega\sqrt{r^2 + 2rc\cos\beta + c^2}$$

The tangential acceleration $= p_t$

$$= \frac{dv}{dt} = \frac{-2\omega^2 rc\sin\omega t}{2\sqrt{r^2 + 2rc\cos\beta + c^2}}.$$

$$= -\omega^2 c\frac{r\sin\beta}{\sqrt{r^2 + 2rc\cos\beta + c^2}}.$$

The normal acceleration $= p_n = \frac{v^2}{\rho}$

$$\rho = \frac{\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{\frac{3}{2}}}{\frac{d^2y}{dx^2}},$$

$$\text{or } \rho = \frac{\left\{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right\}^{\frac{3}{2}}}{\frac{d^2y}{dt^2}\frac{dx}{dt} - \frac{d^2x}{dt^2}\frac{dy}{dt}} = \frac{\omega^3(r^2 + 2rc\cos\beta + c^2)}{-\omega^3 rc\cos\omega t - \omega^3 c^2}$$

$$= -\frac{(r^2 + 2rc\cos\beta + c^2)^{\frac{3}{2}}}{c(c + r\cos\beta)},$$

whence $p_n = \frac{v^2}{\rho} = -\omega^2 c\frac{c + r\cos\beta}{\sqrt{r^2 + 2rc\cos\beta + c^2}}.$

The normal force, N, therefore, is $N = Mp_n =$

$$-M\omega^2 c\frac{c + r\cos\beta}{\sqrt{r^2 + 2rc\cos\beta + c^2}}.$$

Also, the tangential force is $T = Mp_t =$

$$-M\omega^2 c\frac{r\sin\beta}{\sqrt{r^2 + 2rc\cos\beta + c^2}}.$$

The vertical restraint upon the counterpoise is the algebraic sum of the vertical components of the forces N and T, and the horizontal restraint is the algebraic sum of the horizontal components of the forces N and T. If V' and H' represent, respectively, these vertical and horizontal forces, then:

$$V' = T\sin\theta + N\cos\theta$$

and $$H' = T\cos\theta - N\sin\theta.$$

From the figure, $\tan\theta = \frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$;

$$\text{also, } \sin\theta = \frac{\tan\theta}{\sqrt{1 + \tan^2\theta}} = \frac{\frac{dy}{dt}}{\sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}} =$$

$$-\frac{c\sin\beta}{\sqrt{r^2 + 2rc\cos\beta + c^2}}$$

$$\text{and } \cos\theta = \frac{1}{\sqrt{1 + \tan^2\theta}} = \frac{\frac{dx}{dt}}{\sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}} =$$

$$\frac{r + c\cos\beta}{\sqrt{r^2 + 2rc\cos\beta + c^2}}.$$

Therefore, $V' = -M\omega^2 c\left\{-\frac{rc\sin^2\beta}{r^2 + 2rc\cos\beta + c^2} + \frac{(c + r\cos\beta)(r + c\cos\beta)}{r^2 + 2rc\cos\beta + c^2}\right\}$

$$= -M\omega^2 c\frac{r^2\cos\beta + rc(1 - \sin^2\beta + \cos^2\beta) + c^2\cos\beta}{r^2 + 2rc\cos\beta + c^2}$$

or $$V' = -M\omega^2 c\cos\beta.$$

Likewise, $H' = -M\omega^2 c\left\{\frac{r^2\sin\beta + rc\sin\beta\cos\beta}{r^2 + 2rc\cos\beta + c^2} + \frac{c^2\sin\beta + rc\sin\beta\cos\beta}{r^2 + 2rc\cos\beta + c^2}\right\}$

$$= -M\omega^2 c\frac{r^2\sin\beta + 2rc\sin\beta\cos\beta + c^2\sin\beta}{r^2 + 2rc\cos\beta + c^2}$$

or $$H' = -M\omega^2 c\sin\beta.$$

As V' and H' are the forces causing the counterpoise to follow its path, the reacting influence of the counterpoise is through the forces $V = M\omega^2 c\cos\beta$, and $H = M\omega^2 c\sin\beta$.

The first terms ($M\omega^2 c$) of the second members of these equations are the well-known expressions for the centrifugal effect of a counterpoise whose mass is M and which is rotating in a circular path at a distance c from the center of the axle. If β were measured from the horizontal instead of from the vertical, it would become the angle α of Mr. Parke's paper and gives M its value: $V = \frac{W_c}{g}\omega^2 c\sin\alpha$, and $H = \frac{W_c}{g}\omega^2 c\cos\alpha$.

Liquid Fuel for Locomotives.

The Engineer of March 9 contains an account of a run by "Petrolea," the Great Eastern Railway locomotive, which burns refuse liquid fuel consisting of a mixture of common gas tar, oil gas tar and creosote oils in conjunction with solid fuel. Combustible refuse may be utilized at a minimum cost with inexpensive solid fuel such as inferior coal, slack, lignite, wood, peat, cinders and even sawdust. The locomotive and its workings were very fully described with illustrations in the *Railroad Gazette* of Feb. 26, 1892.

The report in *The Engineer* contains some information with regard to the economy resulting from the use of liquid fuel. It is estimated that the cost of liquid fuel relatively to coal may be arrived at by taking 1 lb. of liquid fuel as equal to 2 lbs. of coal. With a train of 16 coaches, weighing all told 175 tons, the "Petrolea" burned about 12 lbs. of liquid fuel and 10 lbs. of solid fuel per mile, making 22 lbs. of fuel all told. A sister engine of "Petrolea" has burned on an average for a month 10.5 lbs. of liquid and 11.8 lbs. of coal, while another engine identical in dimensions burned 35.4 lbs. of coal per mile, doing the same duty. The normal cost of these residue oils to the Great Eastern Railway has been 21s. per ton, and of coal 14s. 6d. delivered, but the coal strike has so seriously affected prices that at the time the run was made oil was worth 34s. per ton and coal 21s. 6d. Under the latter conditions the practical result is that two tons of coal at 21s. 6d. cost 43s., and being replaced by one ton of oil at 34s. the saving is 9s., equal to 20 per cent. in favor of liquid fuel. Allowing for the coa burned in combination, taking the rate of combustion as shown by the engine "Petrolea" on the late trip described, namely, 10 tons of coal and 12 tons of oil, as against 34 tons of coal there was a net saving of nearly 15 per cent. in cost. There should also be taken into account the small expense of handling the oil as compared with that of coal irrespective of the great convenience of firing with oil.

Great advantage is also claimed in the use of oil from the steady head of steam that can be maintained, it being only necessary to open a valve to admit more oil and to raise the steam if it is lagging, or to partly close the valve if the engine is blowing off. Another advan-

tage is that the combustion is perfect, there being no smoke except when fresh coal is added. It is necessary to add coal only at long intervals, which saves the opening of the fire door, and the saving of labor to the fireman is great. On the trip described 70½ miles were made from Liverpool to Ely in 97¼ min. The report contains little else of special interest not contained in the issue of the *Railroad Gazette* before mentioned.

The Great Venezuelan Railroad.

This road, connecting Caracas with Valencia, the city next in size to the capital of Venezuela, was completed and opened for business in February, and is the subject of an interesting sketch in a recent number of *Engineering*. The length of the line is 180 kilometers, or 112 miles. It has been built under the "Krupp concession," by the Grosse Venezuela Eisenbahn Gesellschaft, of Berlin, and is spoken of as one of the most important enterprises ever undertaken by Germans abroad. Leaving Caracas, the line follows the valley of the Guairé for some distance, and reaches the summit of the northeastern Andes at Corozal, 30 kilometers (19 miles) from Caracas. Here is a tunnel 267 meters (876 ft.) long, and the line then descends on a 2 per cent. grade to the valley of the River Tuy. The scenery here is picturesque. At the 94th kilometer from Caracas, La Victoria, with a population of 15,000, is reached. To this point there are 65 tunnels with a total length of 4,080 meters (13,382 ft.), 46 viaducts and 30 large bridges. The rest of the way the line lies through fertile and well-populated valleys in which are large sugar and coffee estates. On the whole line there are 86 tunnels, 60 viaducts and 140 iron bridges.

The gage of this road is 3 ft. 6 in. and the track is well ballasted throughout the line. The rails are 7 meters (23 ft.) long and weigh 52.7 lbs. per yard. The sleepers are iron, 9 to each rail, and 31½ in. apart, except at the joints, where they are 20 in. apart. The minimum curve is of 80 meters (262 ft.) radius, and curves of 100 meters (328 ft.) radius are common. The maximum grade is 2 per cent. (105 ft. per mile), but great sacrifices have been made both in time and cost to keep the grades low. In the mountain district nearly 4,000,000 cu. yds. of rock was moved. The locomotives weigh about 35 tons and are mostly German. The passenger cars are of American pattern, but were built in Germany. The station buildings at the principal places are commodious and substantial, and would do credit to anything of the kind to be seen in the large cities of Europe. The intermediate stations also are supplied with solid iron buildings with cement foundations. The bridges and much of the other ironwork were made in Dortmund, Westphalia. The passenger stations in the vicinity of Valencia are made of gypsum, which is sawn and trimmed so as to fit into the channels of the iron uprights. The joints are made with either cement or lime, and the interiors of the buildings are lined with a double coating of plaster. The total cost of this road to date has been about £3,000,000 sterling.

TECHNICAL.

Manufacturing and Business.

The Thomson Meter Co. announces that on April 3 the company sold its 50,000th water meter.

The Hicks Stock Car Co., limited, has been incorporated in Illinois by Henry M. Heisel, Archibald Cattel and James Mullen.

The Columbus Bridge Company's plant in Columbus, O., has been sold to H. P. Hepburn, the receiver of the property, at his bid of $31,120. The property had been appraised at $43,000.

The Anderson Steel Casting Co., at Anderson, Ind., formerly the Haugh-Kurtz Steel Co., has been reorganized as the Gould Draw Head & Knuckle Co., and will manufacture the Gould car coupling devices.

The New York office of the Leetonia Forging Co. has been removed to 143 Liberty street, where the company is represented by Mr. A. Duchamp, who is also the New York representative of the Kilby Manufacturing Co., of Cleveland, O.

At the annual meeting of the stockholders of the Continuous Rail Joint Co., held at its office in Newark, N. J., April 4, the following directors were elected: George G. Frelingbuysen, Robert Gray, Jr., Frederick T. Fearey, A. W. Thompson and F. C. Runyon.

Mairs & Lewis, contractors, of No. 18 Broadway, New York, commenced work on April 2 on the proposed new boulevard between Elmhurst and Scranton, Pa., with a force of 100 men. They will as soon as possible increase this force to 250, and expect to complete their contract by Aug. 1.

The Baker Forge Co., of Ellwood City, Pa., has been granted a charter, with a capital stock of $5,000. The incorporators are James H. Baker, Allegheny, Pa.; H. W. Bishop, Jr., Osborne, Pa.; W. N. Martin, Pittsburgh. The new concern will manufacture a line of railroad specialties.

At the annual meeting of the stockholders of the King Bridge Company, held in Cleveland, O., April 4, the following were elected directors: James A. King, Dan P. Eells, H. W. King, Harley B. Gibbs and H. W. Osborn. The directors elected James A. King, President; H. W. King, Vice-President; and Harley B. Gibbs, Secretary and Treasurer.

The Youngstown Bridge Co. reports some important bridgework now under way at its shops at Youngstown, O. The company has contracts from the Baltimore & Ohio Railroad for nine spans of girders and trusses on the Midland Division; and other orders include a 75-ft. plate girder span for the Pittsburg & Lake Erie road; four girder spans for Franklin County, O., of from 75 to 80 ft., with steel joists; an 82-ft. double-track plate girder span for the Cincinnati, Lebanon & Northern road, and a 182-ft. plate girder draw for the Washington & Chesapeake Beach Railroad. Some structural work is under way for a mining plant at Aspen, Col., and four large buildings are being built for the Ohio Steel Co., of Youngstown, O., and a car barn for a street railroad at New Orleans.

New Stations and Shops.

The United States Projectile Co., of Brooklyn, N. Y., will erect a brick machine shop, 99 × 102 ft. in size, to cost $8,500.

The loss by fire of the Denver Union station was settled last week by the insurance companies for $60,493, and several firms of architects are engaged upon plans for the reconstruction of the building. About $75,000 will be expended upon it.

Iron and Steel.

The Boston Casting Co., with $50,000 capital, has been incorporated in Massachusetts to succeed the Wrought Iron Casting Co., and will operate the plant at South Boston. F. D. Childs, formerly of the Hinckley Locomotive Works, is President, and W. W. Montgomery General Manager.

The new plant of the Johnson Steel Co., which is to be located at Lorain, near Cleveland, O., will be built by a distinct corporation to be known as the Johnson Co. The charter of this company was secured in Ohio last week with a capital placed at $5,000,000. The incorporators are T. J. Johnson, of Cleveland; A. J. Moxham, of Johnstown, Pa.; Andrew Squire, James Parmelee and H. J. Davies.

Wire-Glass.

The March issue of the *Journal of the Franklin Institute* contains the report of the Committee on Science and the Arts on the Shuman process and apparatus for imbedding wire netting in glass. The report covers 15 pages and contains many illustrations and is a valuable document on this interesting product. The Committee recommends the award to Mr. Shuman of the John Scott legacy premium medal for his machine and process. We have already described this glass, which is used for glazing the roof of the new Broad Street Station of the Pennsylvania Railroad and has been applied to other large railroad structures and is presumably well known to our readers.

What is an Economical Load for a Locomotive?

In reporting Mr. West's paper before the New York Railroad Club on the above subject in our last issue, page 241, we inadvertently omitted one of the principal paragraphs, which is as follows:

In 1890 our company (the New York, Ontario & Western) purchased 10 heavy mogul engines with 19 × 24 cylinders; two of the 10 were assigned to passenger trains, three to milk train service, and the other five were put in the rounds with 15 new consolidation engines with cylinders 20 × 24. When the moguls in freight service had made from 44,000 to 45,000 miles we were obliged to stop them for tire wear. The three on milk trains made 75,000 miles and tire in better condition than any of the five on freight were when they had made but 50,000. The two on passenger trains made 100,000 miles, and tire in better condition than any of the other eight of same class which were making 45,000 and 75,000 miles respectively. Before the three that were assigned to milk service needed shopping, we were pressed for power; our people purchased two moguls with same size cylinders and drivers, but a little less weight, that were built for another road; our plan was to put the newly purchased engines on the milk trains and relieve our own moguls for freight service. The new engines would not haul the milk trains, which demonstrates to my mind that the milk train was the capacity of our moguls, the freight load too heavy and the passenger not load enough. A locomotive weighing from 50 to 60 tons cannot wear a set of tires to an extent requiring turning while making only 45,000 miles, without injury to the track as well as machinery.

Interlocking.

The Johnson Railroad Signal Co., of Rahway, N. J., has received an order to replace the large interlocking machine at Tower No. 1, Grand Central Station, New York City, by a Johnson interlocking machine. The present machine is of the Saxby & Farmer pattern, and has been in service about four years.

Coupler Tests at Altoona.

Mr. J. M. Wallis, chairman of the Committee on Coupler Tests, has issued to the coupler companies an announcement that the tests commenced on Monday, April 9, and will be conducted during the following six weeks. Couplers, however, should be sent as soon as possible to Altoona, care of J. M. Wallis, Superintendent of Motive Power, so as not to delay the tests beyond the middle of May. It is especially desired that couplers be selected from stock and not made for test purposes.

THE SCRAP HEAP.

Notes.

About 100 members of the Ticket Agents' Association started from New York last week via New Orleans for their convention at Los Angeles, Cal.

Two men were arrested in Buffalo last week for selling to scalpers altered tickets which they had stolen from the Chicago & Alton at Joliet, Ill.

The reduction of wages on the Wabash Railroad amounts to about 10 per cent. in the cases of most of the engineers, firemen, conductors and brakemen.

Three train robbers who, in connection with their crime, killed a passenger conductor at Oliphant, Ark., March 31, 1893, were hanged at Newport, Ark., April 6.

The Indiana State Board of Health has issued a circular to the railroads ordering the sanitary inspection of all stations and the supply of pure and wholesome water to passengers. "The work must be done by June 1, and a report made to the Board, as after that time an inspection will be made by the state officers."

The Texas Railroad Commissioners, acting under the law recently passed, have reported their valuation of the Texas & Pacific Railroad, which aggregates $17,060 a mile, and have notified the company that they will report the value of rolling stock for taxation at $1,814,010, which is about $800,000 larger than the valuation reported by the company.

Near Pond Creek, O. T., on the night of April 9 a band of robbers stopped a passenger train of the Chicago, Rock Island & Pacific and blew open the end of the express car with dynamite, but the messenger, Jacob Harmon, was on his guard and shot and killed the first robber who entered. The trainmen came to his assistance and wounded and captured another robber. The rest then fled.

It is now reported that the number of passenger conductors recently discharged on the Cleveland, Cincinnati, Chicago & St Louis was 27, and that the officers state in plain language that dishonesty was the cause. The road had collectors on most of its trains for several years until a few months ago, from which it would appear that the thieving practices have grown up in a pretty short time.

The Maryland Legislature seems to have finally settled the car-heating law, which has been before it for the last month or two, and which has, indeed, been up every session for several years. The state passed a law forbidding stoves in passenger cars several years ago but the railroads have year after year pleaded inability to comply and have secured postponement of the enforcement of the law, and a bill has now been passed placing the whole matter in the hands of the Board of Public Works. When it is shown to the satisfaction of this board that it is impracticable to do away with car stoves at once, the board may prescribe what number or portion of the cars of any road shall be heated by a continuous system.

Supply Exhibits at the Technical Conventions.

Mr. F. W. Coolbaugh, as chairman of a special committee, announces that arrangements have been made for erecting the proposed line of power shafting at the Saratoga conventions. The cost to exhibitors utilizing this shafting will be pro rated at cost price, so that the expense to individual exhibitors will be little more than nominal. Applications for space and power should be made promptly to Mr. R. C. Blackall, Delaware & Hudson Canal Company, or to Mr. Coolbaugh, at 29 Broadway, New York.

The Medals of the Franklin Institute.

The last issue of the Journal of the Franklin Institute announces the awards by its Committee on Science and the Arts (subject to proper objection) of the Elliott Cresson medal to Nikola Tesla, for researches and discoveries in high frequency phenomena, and of the John Scott legacy medal to H. P. Werdig for a system and apparatus for extinguishing fire; to Edward G. Acheson, for invention of carborundum, a new abrasive material; to F. Pontrichet for an improved blackprint process; and to Charles Spiro for the bar lock typewriter.

The Park Avenue Improvement.

Mairs & Lewis, of No. 18 Broadway, New York, who have the contract to construct the trestles on the Park Avenue improvement in New York, commenced work on April 10. They expect to employ a large force and complete their contract at the time fixed. They are already hauling timber which was ordered, cut and shipped since the contract was signed, less than three weeks ago.

Prompt Obedience as the Rule Requires.

A conductor was examined on time-table rules. He was asked: "What is necessary before a train can leave a station?" "A signal from the conductor," he replied. "And then what does the engineer do?" "Gets down and oils around."—*Exchange.*

The Great Northern Tunnel at Everett, Wash.

The Great Northern Railway is receiving tenders for the construction of a tunnel 2,000 ft. in length at Everett, Wash., on Puget Sound. It will be almost exclusively earthwork, and is in the city proper. The object is to avoid a long detour in reaching the terminals in the city.

Commodore Melville's Advice to Young Engineers.

Few men are better fitted to give advice to young engineers than Commodore Melville, Engineer-in-Chief U. S. Navy, and the following general ideas are selected from an address delivered by him last February to the students of Sibley College, Cornell University. The ideas are elaborated and explained in the address, but there is room here for only the main points.

"All that can be done in textbooks is to state general principles and the more important features; a great deal of the most valuable information that you will get will have to come from your own experience and reading later. There is a tendency on the part of young men when they leave technical schools to think that there is little, if anything, left for them to learn. This frame of mind is productive of nothing but harm. Your education is, in a measure, only a tool for use in your future work. The greatest value of the engineer comes from mature experience and judgment, which, of course, can only come with years. Never lose an opportunity to gain professional information; when you hear older men discussing problems, weigh carefully what they

say, and make a note of any information you may have gained. The very ablest men are the quickest to ask information from those who are in a position to give it. The advantage of a manual training obtained with an education, is the knowledge it gives the engineer of the possibilities of the workshop. It is very important that the engineer render himself familiar, at as early a stage of his professional career as possible, with the possibilities of all the tools which handle the work designed by the engineer. The lack of such information is sometimes the cause of failure of a designer. The engineer requires sufficient literary training to be able to express himself clearly and convincingly. He requires a different style from the lawyer or the theologian, but a good style can be acquired in the usual way. Do not neglect the study of the living languages. The best books are generally translated into English, yet the one who waits for the translation will be several years behind him who can translate for himself. It is also very important that you become accustomed to speaking in public, because in the meetings of engineering societies it frequently happens that the discussion of a paper is more valuable than the paper itself; it therefore follows that the benefit to all will be much greater if each speaker can make his remarks clear, concise and logical. Be absolutely faithful in all the work you do; do not despise or neglect a part that seems comparatively unimportant. While the old adage that 'What is worth doing at all is worth doing well' is very true for the majority of things, it does not mean that polished surfaces should be used on work that will be buried in the ground. Do not be afraid to assume responsibility. Do not agree to do work for which you know you are incompetent; but when the opportunity comes to do work for which you really know you are as competent as any man of your age, do not hesitate to accept it. Under these conditions the mistakes you may make should be only those into which any one else would be liable to fall, and for these there is always forgiveness."

CAR BUILDING.

An equipment mortgage for $207,500, given by the New York, Ontario and Western in favor of the Michigan-Peninsular Car Co., was recorded in New Jersey last week.

BRIDGE BUILDING.

Allentown, Pa.—A. Monroe Stephens, of this city, has been awarded the contract for the new bridge over Fell's Creek, near Laury's. His bid was $847.

Alton, Ill.—The new bridge across the Mississippi River at Alton, Ill., was tested last week, and trains were run over the bridge on April 3. The formal opening, however, will be delayed until May 1.

Cambridge Md.—The rebuilding of the bridge across Cambridge Creek and the enlargement of the draw to 120 ft. will soon be undertaken by the County Commissioners. The work will cost about $12,000.

Columbus, O.—The contract for the superstructure of the Sunbury Pike bridge over Alum Creek has been awarded to the Youngstown Bridge Co. at its bid of $3,930. This company has also been awarded the contract for the superstructure for the Clifton avenue bridge over the same stream at its bid of $5,230.

Easton, Pa.—Northampton County, it is expected, will erect a new bridge over the canal in Lehigh township to take the place of the structure recently abandoned by the Lehigh Coal & Navigation Company.

Fryeburg, Me.—Mr. John Towne, representing the Berlin Bridge Co., has taken a contract to build a steel bridge across the Saco River at Fryeburg, Me.; also a bridge across the Little Androscoggin at West Paris, Me.

Georgia, Vt.—The contract for building the Georgia bridge on the Central Vermont Railroad has been let to the Pencoyd Bridge Co. to be completed by July 1. This bridge is a three span deck lattice 460 ft. long, covered with Thomson's solid rail floor ballasted with gravel, from designs of G. H. Thomson, Consulting Engineer.

Grenada, Miss.—The Board of Supervisors of Grenada County have signed a contract with the King Bridge Co. of Cleveland, Ohio, for a $20,000 steel suspension bridge, to be erected over the Bogue Bayou in the city. The bridge is to be finished by October next.

Maryland.—The following bills have been approved by the Governor of Maryland: Authorizing repairs to Dover bridge; incorporating the Curtis Creek Bridge Co.; incorporating the new Warsaw Bridge Co.; authorizing the building of a drawbridge across Bear Creek; authorizing Wicomico County to build a drawbridge; authorizing the Carolina County Commissioners to build a bridge over Great Choptauk River.

Morrellville, Pa.—The Pennsylvania is favorable to the erection of at least one of the two overhead bridges petitioned for by the people of this place.

Osceola, Wis.—Congressman Haugen, of Wisconsin, has introduced a bill in the House of Representatives, granting the right to build a wagon drawbridge over the St. Croix River between Minnesota and Wisconsin to the village of Osceola, Wis.

Philadelphia, Pa.—The bill providing for the appropriation of about $800,000 for new bridge work in the city of Philadelphia which failed to pass the last City Council, has been reintroduced. The appropriations provided for in the bill have been approved by the Director of Public Works, and it is expected that the bill will pass without serious opposition. The most important bridge provided for in the bill is that over the Schuylkill River at the Falls of Schuylkill, which will cost about $300,000. The other bridges included in the appropriation were published in this column some weeks ago. The proposed bridge at Gray's Ferry in the southern section of the city is also likely to be authorized by the City Council. The project has the approval of the Mayor and the Public Works Department. The bill now before the Council provides for a double-decked iron structure to cost about $180,000, the city to pay one-third of the cost. The Pennsylvania Railroad and the Philadelphia Traction Co. will pay the other two-thirds.

Pittsburgh, Pa.—Common Council on April 9 passed the ordinance providing for a free bridge to be located at South Twenty-second street. The ordinance directs that plans be prepared and contracts awarded for a bridge from South Twenty-second street to a point on Forbes street, near Brady street. It would cost between $300,000 and $400,000. The ordinance authorizing the issuing of bonds to the amount of $1,500,000 for the purpose of free bridges passed without debate. The bonds are to run 30 years, pay 4 per cent. interest and cannot be sold by the city for less than par. Select Council ratified the action of Common Council with respect to the above ordinances.

Raubsville, Pa.—A bridge across the Delaware, between this place and Carpenterville, N. J., is being talked of.

Richardsville, N. Y.—A bill has been introduced in the New York Assembly appropriating $13,000 for a bridge over the Oneonta Creek at this place.

South St. Paul, Minn.—The South St. Paul Belt Line Bridge & Railway Co. is asking aid from two of the towns on the east side of the Mississippi River to aid in the construction of the proposed combination railroad and wagon bridge at this point. South St. Paul has voted $75,000 in bonds in aid of the project, and the towns of Newport and Cottage Grove will, this week, vote on the proposition to issue bonds, respectively, for $20,000 and $5,000. If this bridge is built and the few miles of road constructed, it will connect the tracks of the Chicago Great Western on the west side of the river with those of the Chicago, Milwaukee & St. Paul and the Chicago, Burlington & Northern on the east bank. E. J. Hodgson is President of the company and S. W. Mattson is its Secretary. Communications should be addressed to them at St. Paul, Minn.

Warren, O.—A bill introduced in the legislature authorizes this town to build a $13,000 bridge.

Warren, Pa.—A new free bridge may be erected over the Allegheny at this place.

Williamsport, Md.—The question of the erection of a bridge over the Potomac at this point is being agitated.

York, Pa.—The Wrought Iron Bridge Co., of Canton, O., has been awarded the contract for strengthening the Princess Street bridge.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Supreme Court of Colorado holds that the statutes which fix the amount to be paid for certain kinds of animals by an arbitrary schedule of prices, and provide for the fixing of the value of other animals by appraisers without allowing proof of actual value, and which make the company absolutely liable, are unconstitutional, in that under them a railroad company may be denied the equal protection of the laws, and deprived of its property without due process of law.[1]

The Supreme Court of Texas rules that a contract by which a number of railroad companies "lease" their roads and other property to one company for 99 years, the latter company agreeing to operate and maintain the lines and pay to each of the other companies a certain proportion of 93 per cent. of the net profits from such operation, is a contract of partnership, and not a lease.[2]

A Kansas statute provides that every railroad company in the state shall be liable for damages to any employee, in consequence of any negligence of its agents, or by any mismanagement of its engineers or other employees. The Supreme Court holds that the right of a baggageman under this statute to damages for an injury from the negligence of other trainmen is not affected by the fact that the railroad is at the time in the custody of a receiver, and operated by him.[3]

A Washington statute, known as the "Gross Earnings Law," which provided for the taxation of the gross earnings "in lieu of any and all other taxes upon any railroad . . . or upon the equipment, appurtenances or appendages thereof, or upon any other property situated in this territory, belonging to the corporation owning or operating such railroad," is held by the Supreme Court did not limit the exemption from taxation to property actually used in the operation of railroads, but exempted all property of such corporations.[4]

The Supreme Court of Maine rules that the statute which makes railroad corporations liable to pay for the work of laborers in constructing their roads does not apply to the labor of a subcontractor, personally expended, with that of a crew employed by him, on a section of road which he has contracted to build.[5]

Injuries to Passengers, Employees and Strangers.

In the Federal Court it is held the duty of a person about to take passage on a railroad train to inform himself when, where and how he can stop, under the regulations of the railroad company; and if he makes a mistake, not induced by the company, against which ordinary care in this respect would have protected him, he has no remedy against the company for the consequences.[6]

In Texas it is held that where a train is in charge of a conductor, a brakeman is not authorized to make statements to passengers as to the movements of the train, and a passenger who is injured by relying on such statements cannot recover from the company.[7]

The Supreme Court of Indiana rules that the fact that the amount of additional fare wrongfully demanded of a passenger before ejecting him was trifling and could have been paid by him, and that the conductor advised him to pay it and fix the matter up with the ticket agent, cannot be considered in mitigation of damages for such ejection.[8]

In Texas an auction sale of land in a distant city had been advertised by the owners of the land. A railroad company placed excursion tickets to the city and return in the hands of its agents, good for a certain limited time, at reduced rates. The Supreme Court rules that a purchaser of one of those tickets, who used all diligence after the sale to make the return trip, could not be lawfully expelled from one of the railroad company's trains, though the limited time had expired.[9]

The Supreme Court of Texas holds that a railroad is not liable for the willful act of a brakeman in kicking a trespasser from its moving train, whereby the latter was killed, in the absence of evidence to show that it was within the general scope of the brakeman's authority to eject trespassers from its trains.[10]

In Alabama, in an action for the death of a section hand, caused by a collision of defendant's hand cars, on one of which deceased was riding, one count of the petition alleged that each of such cars was "under the superintendence of H., the foreman in charge, and by the allowance of the foreman aforesaid said cars were being run at a rapid and reckless rate of speed," and "that by the carelessness and negligence of the foreman in charge in allowing said cars to run at such a high rate of speed" the same collided, causing intestate's death. The Supreme Court holds that the petition sufficiently showed that the negligent acts charged were committed by the defendant's servants.[11]

In New York the Supreme Court holds that a brakeman who has been more than a year in the employ of a railroad company assumes the risk incident to the fact that some of the guard rails in the company's yards are not blocked, so as to prevent an employee's foot from being caught between the guard rail and the main rail.[12]

In a case that came before the Federal Court, a gang of seven or eight railroad laborers was put to work tearing down a heavy shed, 60 to 70 ft. long, by sawing it asunder in the middle, cutting off the supporting posts, and then pushing it over in a direction against the wind. The only tools furnished for the work were four axes, one saw, one crowbar, one pinchbar, hammers, a maul, and two pieces of unsound plank, picked up for the occasion. The shed fell in the wrong direction, and injured one of the laborers. The Court holds that the evidence justified a verdict finding the company guilty of negligence.[13]

In another case in the same court a yard clerk in a railroad freight station, whose duty required him to go into the yard for the purpose of getting a record of the seals of the cars which each train left or was to take away, was injured by the backing down upon him of part of a freight train in control of the engineer and train hands. The Court decides that the injury was caused by fellow-servants, and the company was not liable.[14]

The Supreme Court of Georgia rules that the mere fact that a railroad fails to recover from a discharged employee a key which controls a switch does not of itself make the company liable for the act of such employee in misplacing a switch in order to wreck a train. The company is not bound to anticipate that, out of revenge for his discharge, a former employee might secretly commit so heinous a crime. Nor is it bound to watch constantly to prevent all persons not in its employ from tampering with its switches or tracks. Whether, in any particular case, the company exercised proper care in protecting its switches, is a question for the jury, and they may look to the evidence to ascertain if it had any reason to apprehend such interference, and, if so, whether it used due diligence to prevent the same. In its charge the court should not state or assume that a given state of facts would show negligence in this respect.[15]

In a case in the Federal Court, under the rules of a railroad in case of an extraordinary storm, trains were required to stop before crossing bridges until a man had been sent forward to inspect them. Conductors were required to make careful inquiry at all stopping places, and, when thought advisable, to make extra stops, to ascertain the extent of storms, taking no risk. The conductor and engineer of a train sent out to repair a railroad after a heavy storm knew of the dangerous condition of the roadbed. A section foreman signaled the train to stop, to give information of the dangerous condition of a bridge, and the engineer slackened, whereupon the conductor signaled him to go ahead, and the train proceeded at 15 miles an hour, without receiving the section foreman's information, ran upon the bridge, disregarding a danger signal placed thereon; and broke it down, injuring plaintiff, who was on the train. The Court holds that it could not be said as a matter of law that the engineer's negligence in disregarding the danger signal interrupted the sequence between the negligence of the conductor in ordering the train ahead without obtaining the section foreman's information and the injury complained of, and that the Court properly left to the jury the question whether the conductor's negligence was the proximate cause of the injury.[16]

The Supreme Court of Mississippi holds that a verdict for plaintiff in an action for injuries at a railroad crossing, under proper instructions as to the plaintiff's contributory negligence, will not be disturbed on the ground that she might have saved herself, where the train was not discovered till the team was within a few feet of the railroad, and it is doubtful if she had time to disincumber herself of her sister, who was sitting on her lap, and leap from the carriage, and the jury may have been of the opinion that she had not time for deliberation and action, and was for the moment paralyzed with fear.[17]

[1] Rio Grande R. Co. v. Vaughn, 34 Pac. Rep. 264.
[2] G., H. & S. A. Ry. Co. v. Davis, 23 S. W. Rep., 301.
[3] Hornsby v. Eddy, 56 Fed. Rep., 461.
[4] C. & P. S. v. Chilberg, 34 Pac. Rep., 163.
[5] Rogers v. D. & P., 27 Fed. Rep., 257.
[6] Texas & P. v. Ludlam, 57 Fed. Rep., 481.
[7] I. & G. N. v. Armstrong, 23 S. W. Rep., 236.
[8] Lake Erie & W. v. Arnold, 34 N. E. Rep., 742.
[9] T. & P. v. Dennis, 23 S. W. Rep., 400.
[10] T. & P. v. Moody, 23 S. W. Rep., 41.
[11] A. & R. v. Dusenberry, 13 South. Rep., 308.
[12] McNeil v. N. Y., L. E. & W. (Sup.), 24 N. Y. S., 616.
[13] C. C., C. & St. L. v. Brown, 56 Fed. Rep., 804.
[14] N. Y. & N. E. v. Hyde, (C.C.A.), 56 Fed. Rep., 188.
[15] E. T., V. & G. v. Kane, 18 S. E. Rep., 18.
[16] U. P. v. Callaghan, 56 Fed Rep., 988.
[17] Ala. & V. v. Davis, 13 South. Rep., 693.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Central of New Jersey, quarterly, 1¾ per cent., payable May 1.

Pittsburgh, Cincinnati, Chicago & St. Louis, 2 per cent. on the preferred stock, payable April 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Central of New Jersey, annual, Jersey City, N. J., May 11.

Cincinnati, Saginaw & Mackinaw, annual, Saginaw, Mich., April 17.

Dauphin & Berks, annual, Philadelphia, Pa., May 7.

Delaware & Hudson Canal, annual, New York City, May 8.

Dutchess County, annual, Poughkeepsie, N. Y., May 7.

Elmira & Lake Ontario, annual, New York City, May 3.

Grand River Valley, Jackson, Mich., April 25.

Harlem River & Port Chester, annual, New York City, April 14.

Lake Shore & Michigan Southern, annual, Cleveland, O., May 2.

Michigan Central, annual, Detroit, Mich., May 3.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 16.

New York Central & Hudson River, annual, Albany, N. Y., April 18.

New York, Chicago & St. Louis, annual, Cleveland O., May 2.

Philadelphia, Harrisburg & Pittsburgh, annual, Philadelphia, Pa., May 7.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 4.
Toledo, Ann Arbor & North Michigan, annual, Toledo, O., April 18.
Union Pacific, annual, Boston, Mass., April 25.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows :

The *Master Car Builders' Association* will hold its annual convention at Saratoga, N. Y., beginning June 12. The hotel headquarters will be at Congress Hall, H. S. Clements, Manager.

The *Master Mechanics' Association* will hold its annual convention at Saratoga, N. Y., beginning June 18.

The *National Association of Local Freight Agents* will hold its annual convention at Pittsburgh, Pa., June 12, 13, 14. The headquarters will be at the Monongahela House.

The *Association of American Railway Accounting Officers* will hold its next annual meeting at Washington, D. C., commencing May 30.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November. The next meeting will be on Thursday, April 19, at 10 a. m. The subjects for discussion were published in our issue of March 23.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month at 8 p. m. The annual convention will be held at the Cataract House, Niagara Falls, N. Y., beginning June 20.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas Place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 7:30 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month at 8 p. m.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month.

The *Scandinavian Engineering Society of Chicago* meets in room 309, Title and Trust Building, 100 Washington street, on the third Thursday in each month.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

Engineering Association of the South.

At the regular monthly meeting of the association held in Nashville on April 12, Dr. J. M. Safford made an address on the "Recently Discovered Phosphate Beds of Tennessee."

New England Railroad Club.

The subject for discussion at the regular meeting of the Club at Wesleyan Hall, 36 Bromfield street, Boston, on April 11, was "Railroad Switching and Yards," a paper being read by E. K. Turner, formerly Chief Engineer of the Fitchburg Railroad.

Boston Society of Civil Engineers.

The annual meeting of the Society was held at its rooms, 36 Broomfield street, Boston, Wednesday, March 21, 1894, President John R. Freeman in the chair. Messrs. Austin B. Fletcher, of Cambridge; Perry Lawton, of Quincy; Henry C. Mildram, of Boston; Harold Parker, of Lancaster; Cecil H. Peabody, of Boston; Henry O. Peckham, of Watertown; Thomas F. Richardson, of Winchester; Albert F. Sargeant, Jr., of Malden; Franklin A. Snow, of Providence, R. I.; and Richard H. Tingley, of Providence, R. I., were elected members of the Society.

The annual reports of the Board of Government, the Secretary and the Treasurer were read and from them it appears that the present membership of the Society is 322, a net gain of 12 during the year. Eleven meetings have been held during the year, with an average attendance of 86. The funds of the Society are shown to be in good condition, a net increase of $581 being reported. Reports were also received from the several special committees of the Society.

The election of officers resulted as follows: President, William E. McClintock; Vice-President, Henry H. Carter; Secretary, S. Everett Tinkham; Treasurer, Edward W. Howe; Librarian, Henry F. Bryant; Director, Frank O. Whitney.

Mr. William E. Foss read a paper in which he presented some new modifications of formulas for the flow of water in pipes and channels. Mr. George Bowers, City Engineer of Lowell, gave an account of that city's experience in obtaining a supply of water from driven wells. Mr. Bowers exhibited a large number of photographs illustrating the work and also showed the screens used.

At the next meeting of the Society, to be held April 18, Mr. William B. Fuller will read a paper on Street Grades and Intersections.

PERSONAL.

—Mr. John Blyth, who has been Receiver of the Columbus, Lima & Milwaukee road in Ohio, has resigned that office and has been succeeded by Mr. Otto L. Hayes.

—Mr. George O. Manchester, formerly of the Atchison, Topeka & Santa Fe Railroad, has been elected Vice-President and Treasurer of the Sargent company, of Chicago.

—Mr. Frank Scott, who has been in the Treasurer's Department of the Grand Trunk Railroad for nearly 15 years, has recently been appointed Assistant Treasurer of the company.

—Mr. Nathan K. Elliott, Superintendent of the main line and branches of the St. Louis, Vandalia & Terre Haute, has been appointed General Superintendent of that road to succeed Colonel Joseph Hill, resigned.

—Mr. Charles F. Choate, for many years President of the Old Colony Steamboat Co. (the Fall River line), has resigned, and Mr. J. Kendrick, Third Vice President of the New York, New Haven & Hartford Railroad Co., has been chosen to succeed him.

—Mr. William S. Baldwin, who for some years was General Passenger Agent of the Louisville, New Albany & Chicago, retiring on account of ill health, has about recovered his health, and will next month begin publishing in Buffalo, N. Y., an official local railroad and steamship guide.

—Mr. Archibald H. Dunlap, a prominent business man of Nashua, N. H., died in that town on April 7. Mr. Dunlap was a director of the Nashua & Rochester Railroad and trustee of banking corporations in that State, and for three years was State Railroad Commissioner of New Hampshire.

—Mr. William Byrd Page has been promoted from Road Foreman of Engines to be Assistant Master Mechanic at the Jersey City shops of the Pennsylvania Railroad. Mr. Page succeeds Mr. C. M. Mendenhall, who has been promoted to be Assistant Superintendent of Motive Power at Jersey City.

—Col. Charles S. Millard, prominently known in railroad supply circles, died at Indianapolis on April 8, of paralysis. He had been ill for seven weeks. Colonel Millard was President of the old Southern Car Co., of Louisville, and also of the Indianapolis Car Co., which went into a receiver's hands in 1891.

—Colonel Joseph Hill, General Suparintendent of the Vandalia line, has retired from that position after a railroad service of over 40 years. He is now 70 years old. Colonel Hill has been General Superintendent of the Vandalia line since 1881, when he resigned as Superintendent of the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad. In 1887 he was appointed Assistant General Manager. That office was abolished recently.

—Mr. J. V. Smith was the guest of his associates of the Baltimore & Ohio Railroad on the Eastern lines at a dinner at the Raquet Club, Philadelphia, on April 5, given on the occasion of Mr. Smith's departure for Chicago, to which place he goes as General Superintendent of the Baltimore & Ohio lines west of the Ohio River. Such times are events that remain with a man, and it is gratifying to know that they are becoming more and more in vogue.

—Mr. B. J. Williams, who has been Secretary and Treasurer of the Shelby Steel Tube Co. from its organization to the present time, has resigned, the growing business of the company demanding more attention than he could spare from his banking interests at Shelby. Mr. J. C. Pattison has been elected his successor as Secretary and Treasurer of the Shelby Steel Tube Co. The last monthly shipments of the Shelby Tube Co. reached nearly 350,000 ft.

—Mr. Harry I. Miller, Superintendent of the Louisville Division of the Pennsylvania lines, has been promoted to be Superintendent of the main line of the St. Louis, Vandalia & Terre Haute. Mr. Miller is a son of Mr. John F. Miller, General Superintendent of the Southwest system of the Pennsylvania lines. He has been Superintendent of the Louisville Division for four years. Mr. F. T. Hatch, Division Engineer Maintenance of Way on the Pittsburgh, Cincinnati, Chicago & St. Louis road, has been appointed Superintendent of the Michigan Division of the Vandalia.

—Mr. C. M. Stanton, who was for many years Superintendent of the Ohio & Mississippi up to the consolidation with the Baltimore & Ohio Southwestern, has received from the men of his old division a very pleasing and substantial testimony of their appreciation and regard for him. Last week a delegation of 25 of the men went to his home at Springfield, and presented a silver tea service and other silver table pieces. Mr. Stanton was in the service of the Ohio & Mississippi continuously for nearly 23 years and had been Superintendent since 1875. He is soon to remove to California.

—Mr. C. Miller was elected Acting President of the Kansas City, Osceola & Southern Railroad at a recent meeting of the directors in New York City. Mr. Miller is President and General Manager of the Bangor & Portland Railroad, in Pennsylvania, and is manager of the slate belt properties along the road, largely owned by Mr. John I. Blair, the veteran railroad director of Blairstown, N. J. Mr. Miller's management of these properties has been very successful, and his election as President of the Kansas City, Osceola & Southern Railroad, one of the Blair lines, is evidence that he has the confidence of Mr. Blair. Mr. Miller is now in Missouri inspecting the railroad property, of which he will have full charge, though retaining his office at Bangor, Pa.

—Mr. Augustus Schoonmaker, formerly Interstate Commerce Commissioner, died at his home at Kingston, N. Y., on April 10, from tonsilitis, after an illness of three days. Mr. Schoonmaker was born in Rochester, N. Y., on March 2, 1828. He was educated in the district schools, studied law, and began practice in 1853. After holding several minor offices, Mr. Schoonmaker served as County Judge of Ulster County from 1864 to 1872. In 1875 he was elected to the State Senate as a Democrat, and served till 1877. He was State Attorney-General from 1878 to 1879, in the latter year being defeated for re-election by the Republican candidate. Mr. Schoonmaker was Civil Service Commissioner of New York State from 1883 to 1887. When the Inter-state Commerce Commission was established in 1877, Mr. Schoonmaker was appointed one of its first members, and served three years.

—Hon. J. D. Yeomans, who has been appointed Interstate Commerce Commissioner in place of the late Judge McDill, is 48 years old and has had experience both in railroad operation and construction. The Sioux City *Times* says of him: He was born in Cattaraugus County, New York. His first experience in the railroad business was as an office boy when he was 18 years old. He rapidly advanced to the position of Superintendent, serving as brakeman, conductor and in all intermediate grades. For several years he was Superintendent of the Buffalo, New York & Philadelphia Railroad. During the war he served in important positions in military operations, his abilities in operative work being highly valued. In 1870 he became a member of the railroad contracting firm of Cragie, Raffer & Yeomans, of Buffalo, N. Y., which built many lines of road in Michigan, the ore docks at Marquette and other important works in the Northwest. He is an extensive farmer and stock raiser. Two years ago he was elected to the State Senate from this county, although his residence had been short.

Mr. Yeomans is the first Commissioner to be appointed who has not been a lawyer, and he is the first Commissioner, except Judge Cooley, who has had experience in practical railroad management.

ELECTIONS AND APPOINTMENTS.

Burlington, Cedar Rapids & Northern.—G. Davis has been appointed Division Engineer in place of F. A. Macdonald, resigned. He will have charge of maintenance of bridges and buildings on the main line north of and including Cedar Rapids, and also on the Decorah Division and of any special work that may be assigned him; office at Cedar Rapids, Ia. John Nugent, Roadmaster of Forest City line, has been transferred to Iowa City and Muscatine divisions, with office at Iowa City, Ia. C. H. Gruver has been appointed Roadmaster of the Forest City line, with office at Forest City, Ia.

Chicago & Alton.—At a meeting of the directors held in Chicago, April 2, the following officers were elected: T. B. Blackstone President; Charles H. Chappell, Vice-President and General Manager; Charles H. Foster, Secretary and Treasurer; William Brown, General Solicitor; Chauncey Kelsey, Auditor.

J. C. McMullin, formerly Vice-President, retires from active management, but retains his position on the Board of Directors. Mr. Chappell fills the position made vacant by Mr McMullin's resignation, in addition to the duties of General Manager.

Findlay, Fort Wayne & Western.—The following officers of the reorganized company were elected this week: General Manager, C. G. Patterson; Comptroller, C. H. Roser; General Freight and Passenger Agent, J. H. Russell; Master of Transportation, E. C. Patterson; Chief Engineer, B. F. Fenton; Master Mechanic, A. W. Stalder.

Fort Worth & Rio Grande.—At the annual meeting held in Fort Worth, Tex., the following directors were elected: H. B. Hollins, C. M. Wicker, John S. Ellis of New York, K. M. Van Zandt, Peter Smith, E. W. Taylor, John Hornby, B. B. Paddock of Fort Worth, and Brooke Smith of Brownwood. The following officers were also elected: John Hornby, President; C. M. Wicker, Vice-President; A. Dixon, Secretary, and J. Van Rensselaer, Treasurer.

Fulton County Narrow-Gage.—Owing to continued poor health Auditor J. D. Temple has been obliged to retire from active service and Mr. John A. Westblade has been appointed acting Auditor, with office at Lewistown, Ill.

International & Great Northern.—The annual meeting was held in Palestine, Tex., April 2, and the following directors were elected: George J. Gould, Edwin Gould, Howard Gould, S. H. H. Clark, H. B. Kane, A. R. Howard, Ira H. Evans, F. A. Rice, and R. B. Hawley. The officers elected were: George J. Gould, President; S. H. H. Clark, First Vice-President; H. B. Kane, Second Vice-President; A. R. Howard, Secretary and Treasurer; H. B. Henson, Assistant Secretary and Treasurer.

Long Island.—At the annual meeting held in New York City April 10 the following directors were elected: Austin Corbin, Charles M. Pratt, Frank L. Babbott, Watson B. Dickerman, George S. Edgell, James D. Campbell, Dumont Clarke, J. G. K. Duer, William B. Kendall, Daniel Lord, John P. Townsend, Everett R. Reynolds and Andrew R. Culver.

Mobile & Ohio.—E. E. Posey, Acting General Passenger Agent, has been promoted to be General Passenger Agent, with headquarters at Mobile, Ala.

New York & New England.—The directors have re-elected James W. Perkins, Secretary, and George B. Phippen, Treasurer, both with headquarters at Boston.

Palestine & Dallas.—The company has been organized at Dallas, Tex., and officers and directors elected as follows: George W. Birkitt, of Dallas, President; D. Murphy, Vice-President; Hugh Burns, Treasurer; H. L. Wright, Secretary; directors, George W. Birkitt, Hugh Burns, D. Murphy, Joe McSweeny, Charles McSweeny, H. L. Wright and A. W. Gregg.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The

annual meeting was held in Pittsburgh, Pa., April 10. The Board of Directors being classified, only three directors were elected. They were James McCrea, of Pittsburgh; W. H. Barnes, of Philadelphia, and Samuel S. Dennis, of Newark, N. J.

Pittsburgh, Shenango & Lake Erie.—At the annual meeting held in Meadville, Pa., April 3, the following directors were elected: Samuel B. Dick, A. C. Huidekoper, Thomas H. Wells, Allen M. Cox, John Dick, John E. Reynolds, Dumont Clarke, Henry M. Dechert, S. Quackenbush, W. C. Culbertson and W. S. Rose. The officers elected were: President, Samuel B. Dick; Vice-President, A. C. Huidekoper; General Manager, J. T. Blair; Secretary, P. E. McCray; Treasurer, Daniel Moore.

Southern Pacific.—The annual meeting was held in San Francisco, Cal., April 4, and the following Board of Directors was elected: C. P. Huntington, C. F. Crocker, T. H. Hubbard, Russell J. Wilson, S. T. Gage, N. T. Smith, W. H. Crocker, H. E. Huntington, T. E. Stillman, A. N. Towne and J. C. Stubbs. Russell J. Wilson and William H. Crocker are the new members, the latter replacing his brother, George Crocker. The election of Russell J. Wilson and the re-election of Stephen T. Gage and N. T. Smith, who represent the Stanford interests, would seem to disprove the recent statements that Mrs. Stanford proposed to withdraw her interest in the company.

Staten Island.—The following directors were elected at the annual meeting held at St. George, Staten Island: Charles H. Bass, A. Horrmann, J. H. F. Mayo, Frank S. Gannon, Joseph Tate, L. Dejonge, Jr., C. A. Canavello, James M. Fitzgerald, E. P. Goodwin, G. F. Kreischer, William King, Walter F. Elliott and J. J. Winants. Frank S. Gannon was elected President; Joseph Tate, Vice-President, and Edward Curry, Secretary and Treasurer.

St. Louis, Vandalia & Terre Haute.—The following changes have been announced: N. K. Elliott, Superintendent of the Maine Line and Michigan Division, appointed General Superintendent, with headquarters at Terre Haute, Ind.; H. I. Miller, appointed Superintendent of the Main Line, with headquarters at St. Louis; and F. T. Hatch, appointed Superintendent of the Michigan Division, with headquarters at Logansport, Ind.

Texas, Louisiana & Eastern.—The annual meeting was held in Conroe, Tex., April 3, and the following officers were elected: C. M. Putnam, President; I. Conroe, First Vice-President; J. A. Smyth, Secretary and Treasurer.

Zanesville & Ohio River.—A. P. Deeds, Ticket Agent at Malta, has been appointed Auditor of the road, vice F. E. Smith, resigned.

RAILROAD CONSTRUCTION

Incorporations, Surveys, Etc.

Altoona & Philipsburg Connecting.—The decision of the Pennsylvania Supreme Court in reversing the decision of the lower court and thus preventing the Altoona & Philipsburg road from crossing at grade the Tyrone & Clearfield road will be only a temporary embarrassment, the officers of the road claim. President Langdon says no time will be lost in building the overhead crossings and in getting the road into successful operation. The change in the crossings from grade to overhead will be a heavy and costly work, but it is thought the work will be completed by June 1, as far as Houtzdale at least. The Mapleton crossing will be built first, so that the road between Philipsburg and Osceola, Pa., can be put in operation as soon as possible. The road as now located crosses the Tyrone & Clearfield at grade at six places.

Arkville & Margaretsville.—A railroad connecting Arkville and Margaretsville, N. Y., will probably be built this summer, the money being furnished by local capitalists. Margaretsville and Arkville are both in the very heart of the Catskills, and are summer resorts.

Bangor & Aroostook.—The town of Patten in Penobscot County, on March 26, voted a subsidy of $15,000 to aid in building a branch of this road into that town from the present line near the town of Crystal, four or five miles south of Patten.

Batavia & Northern.—This project for a railroad from Batavia north to Lake Ontario has been taken up by the firm of Emmons, Dwyers & Co., of Syracuse and New York City. Mr. E. W. Emmons, of that firm, has been in Batavia and along the route for some weeks past. He asks that the towns along the line subscribe for about half of the capital stock of $325,000. The town of Albion, he reports, has agreed to subscribe for $60,000, and the town of Batavia and Genesee County are asked to subscribe for $100,000. The line will be about 25 miles long, extending from Batavia north through Elba and Albion to Oak Orchard Harbor, on Lake Ontario.

Blaine & Eastern.—This company has been chartered in Washington to build a railroad from Blaine southeast through Lynden to a connection with the Seattle, Lake Shore & Eastern at Nooksack, Wash., a distance of 20 miles. The capital stock is $400,000. The incorporators are: D. B. Jackson, Minneapolis, Minn.; H. L. Stone, Aurora, Ill.; B. T. Spencer, George H. Heilbron and Joshua M. Wiestling, Seattle.

Brady's Bend & Butler.—The contract for building that portion of the line from Brady's Bend to Millerstown, Pa., and a connection with the Pittsburgh & Western, will be let in a short time, it is now stated. This new line will shorten the distance by rail from East Brady to Pittsburgh some 20 miles. It will be about 12 miles long from a point on the north side of the Allegheny River directly opposite East Brady, Armstrong County, and extending westerly and southwesterly to a point about five miles north of Butler. The road is projected by J. D. Gillette, of New York, who purchased the property of the Brady Iron Co. some months ago.

Chicago, Yankton & Southwestern.—Articles of incorporation of the company were filed in Iowa last week. The incorporators are Joseph R. Hanson and S. B. Coulson, of Yankton, S. D.; A. M. Holton and Robert A. W. James, of Chicago, and C. Whitlock, Sr., of Park Ridge, Ill. The articles provide for the building of a line of road from LeMars, through Plymouth County to Yankton, 25 miles of the line being in Iowa. For some time surveyors have been at work between LeMars and Yankton.

Columbia & Kootenay.—This railroad, which is now being built by the Canadian Pacific, into the Kootenay mining region in the southern part of British Columbia, is to be extended from Nelson, B. C., about five miles south, to Five Mile Point. The line is to be built this spring and will complete a connection with the northern terminus of the Nelson & Fort Sheppard road.

Columbia River.—A press dispatch reports that Mr. R. W. Baxter has left Portland, Or., for New York, to close arrangements for commencing work on the Columbia River Railroad between Portland and Astoria. The people of Astoria have secured most of the right of way between Goble and Astoria, and are now completing a subsidy.

Columbus, Hocking Valley & Athens.—This is the title of a company recently organized which proposes to lease the Hocking Canal for the purpose of using it as a railroad bed. A bill has been introduced in the Ohio Legislature to authorize the lease. The canal is 42 miles long from Carroll, Fairfield County, to Nelsonville. The road will be a coal road extending into undeveloped coal fields. The bill introduced in the legislature requires the line to be commenced within six months after the passage of the bill, and to be completed within two years. Colonel Fred Remple, of Logan; A. C. Cable, D. H. Moore and O. L. Porter, of Nelsonville; George Hardy and A. O. Bates, of Columbus, and Cleveland men are interested.

Denver, Lakewood & Golden.—A short extension to Tindale, Col., has been begun for the purpose of opening up a better coal and fire clay business.

Elkton, Middletown & Massey.—A party of Pennsylvania Railroad engineers under W. B. Pritchard began a survey this week from Elkton, Ind., through the eastern perinsula of Maryland. The route will be from Elkton through Chesapeake City to St. Augustine, at which point the road will divide, one branch going to Middletown, Del., the other through Cecilton to Massey, on the Queen Anne & Kent Railroad.

Galesburg, Etherly & Eastern.—Articles of incorporation have been filed with the Illinois Secretary of State by this company, which proposes to construct a railroad from Wataga, Knox County, extending in an easterly direction to the coal lands of the Galesburg Coal Co., in Knox County, and to a town site in the vicinity of said coal lands to be named Etherly. The principal office is to be at Chicago. The capital stock is $150,000. The incorporators and first Board of Directors are: J. Frederick Brown, George C. Beal, Herbert T. Windsor, John E. Windsor and Byron A. Powers, all of Chicago.

Gulf & Interstate.—The projectors state that they now have two grading outfits, employing about 100 men, at work at Bolivar, opposite Galveston, Tex. The breaking of ground on the Bolivar Peninsula was observed a few weeks ago with great ceremony. Since that day the contractor, C. F. Jones, reports that several miles of the grading has been finished and that the engineers have located about 24 miles of road on the Bolivar Peninsula and are now surveying in Chambers County. President E. Stoddard, of Lincoln; Secretary F. J. Close, of Topeka, and the other officers who went to Texas to see the work started have now returned north.

Kansas City & Waldo.—This company has been chartered in Missouri to build a railroad from Kansas City south to Waldo Park, Jackson County, a distance of five miles. The capital stock is $50,000. The incorporators are: W. E. Winner, George Law, E. S. Young and others.

Lake Superior, Southwestern & Gulf.—Chief Engineer L. F. Steadman, E. I. Rosenfield, Superintendent of Construction, announce that all arrangements have been made for the commencement of construction in May. The first work in Missouri will be at Galena, Stone County, from which point the road will be constructed toward Springfield, Mo., the present headquarters of Messrs. Steadman and Rosenfield. Simultaneously work will be begun at Little Rock, Ark., which has subscribed $200,000 and valuable land. The right of way has been selected through Arkansas from Little Rock to the Missouri state line, and a practicable route has been surveyed from that point to Springfield.

La Porte, Houston & Northern.—General Manage T. W. Lee is reported to have purchased rails and other material for the extension of this line into La Porte, Tex. It is now completed from Harrisburgh, near Houston, to a few miles from La Porte, which is located on Trinity Bay. The road is also graded to Clear Creek, about eight miles south of La Porte, toward Galveston, and the completion of that section is probably also included in the present plans.

Little Rock, Hot Springs & Texas.—Col. Uriah Lott, the projector of this railroad, seems to be making very slow advance with the project. Early in the year the towns of Little Rock and Hot Springs, Ark., raised over $200,000 in subscriptions for the railroad, but as yet no work has been done except some surveying near Hot Springs. Colonel Lott says that the project has not been abandoned, but that he is securing right of way between Hot Springs and Benton, and has already paid $70,000 for land.

Manitoba & Southeastern.—The application of this company for a subsidy from Manitoba was denied early this year by the Provincial Government, but George A. Graham, of Winnipeg, one of the officers, states that he has decided to renew the application for a subsidy modifying those terms of the former application which were objected to by Premier Greenway.

Manufacturers.—An ordinance granting this company right of way on Water street between Olive and Locust streets in Toledo, O., has been before the Toledo City Council for some weeks. The company has been incorporated to build a short freight railroad to reach the factories and warehouses along this street. Many of the incorporators are owners of business property on the street, the chief projector being A. E. Klauser. The ordinance, however, is opposed by a number of the property owners, and the Council has not yet taken any action on the ordinance.

Maryland Roads.—The following bills, passed by the last session of the Maryland Legislature have been signed by the Governor: Incorporating the Frederick & Middletown Railway Co.; authorizing the consolidation of the Washington City & Point Lookout and the Washington & Potomac Railroad Co.; amending the charter of the Baltimore, East Baltimore & North Point Railway; to incorporate the Baltimore & Lorely Railway Co.; authorizing the Dorchester County Commissioners to subscribe to the stock of the Cambridge & Chesapeake Railway Co.; authorizing the Commissioners of Queen Anne County to exempt the bonds of the Queen Anne Railroad for 30 years.

New Roads.—C. F. Lingenfelter, of Claysburg, Pa., is reported to have the contract for a road from South Fork, Cambria County, to Somerset and Bedford counties.

Palestine & Dallas.—The projected railroad between Palestine and Dallas, Tex., heretofore called the Dallas & Southwestern, has been organized under the above name. G. W. Burkitt, of Palestine, of the railroad contracting firm of Burkitt & Murphy, is the chief projector of the railroad and has been elected President of the company. The line will be about 100 miles long. A preliminary survey was made during the winter, and for some months the agents of the company have been engaged in securing the right of way, and arranging with the towns along the route for subsidies for the project, and they have been quite successful.

Point Pleasant, Buckhanan & Tygart's Valley.—The county subscription of $40,000 to the stock of this company, which was voted on in Upshur County, W. Va., on March 29, was carried by a considerable majority. The projectors state that they are now prepared to go ahead and complete the line. It is projected to connect the West Virginia & Pittsburgh and the West Virginia Central & Pittsburgh, extending from Buckhanan to Belington, W. Va. J. W. Heavener, one of the local projectors, states that President Davis, of the West Virginia Central & Pittsburgh, has agreed to give some assistance in the construction of the line between these points.

Poland Springs.—The Ricker Brothers, proprietors of the famous Poland Spring House, at Poland, Me., propose to build a steam railroad for their own convenience to make connection with the cities of Auburn and Lewiston. They will begin the grading at once upon their own land. They have bought most of the right of way along the survey. The line will connect with the Grand Trunk at Lewiston, and that company will operate it.

Queen Anne's.—The projectors report that about $50,000 of the capital stock has been subscribed, sufficient to comply with the state laws to secure the charter for the company in Maryland. Among the subscribers are W. H. Bosley, Bartlett S. Johnston, Robert C. Davidson, John S. Gittings and Middendorf, Oliver & Co., of Baltimore, and W. W. Busteed, J. B. Brown, B. Palmer Keating, of Centreville, Md. The stockholders will meet in Centreville on May 7 to elect directors. The engineers are making surveys to determine the most eligible route. The lines being run from Queenstown to Centreville, and from Centreville to Church Hill, have been completed, and the line from Church Hill to Chestertown is now being surveyed.

San Antonio & Gulf Shore.—Capt. Wm. Davis, of San Antonio, Tex., the projector of this road, announces that he has let the contract to Marcey & Co., of Kansas City, for the construction of the road from San Antonio, Tex., to Velasco, a distance of 170 miles.

Tampa, Clearwater & Gulf Beach.—The proposed railroad between Tampa and Clearwater Harbor, Fla., is to be built under the charter of this company: Silas A. Jones, President; John H. Drew, Vice-President; Syd B. Studivant, Secretary, and T. C. Taliaferro, Treasurer. The route will be from Tampa, Fla., around the head of and skirting Tampa Bay and the town of Clearwater Harbor, Fla., passing through the towns of Safety Harbor, Bayview and New Venice. From Clearwater Harbor it is the purpose of the company to continue the road south along the shores of Clearwater Bay to Seminole, Fla., passing through the towns of Anora and John's Pass. The distance to Clearwater Harbor will be 30 miles and to Seminole 11 miles farther. Only a preliminary survey has been made, but the line will be located at once and the contract will probably be let by June, and work pushed to completion in anticipation of having the road in operation by next November.

Texas Midland.—E. H. R. Green, President of the Texas Midland, states that work on the extension of the road from Roberts north to Paris, Tex., will be commenced in about 10 days and is to be pushed to an early completion. The distance is about 65 miles.

Washington Southern.—The contract for the construction of the Goldsbourgh cut-off in Mason County, Wash., has been awarded to Henry & Balch, of Seattle, Wash. The cut-off will extend from Shelton, on an arm of Puget Sound, directly west a distance of about six miles, to a connection with the main line in Mason County. President R. R. Spencer, of Seattle, states that the cost of the extension will be about $25,000. The new road will cross the divide from Shelton to a junction with the main line, but the grade will not be excessive.

Watervale Manufacturing Co.—The railroad out of Watervale, Mich., briefly referred to in our issue of March 30, is a project of the Watervale Manufacturing Co., of which W. M. Williams is President and L. F. Hale, Secretary and General Manager. The company proposes to build at present about six miles of road from Watervale, near Frankfort, on the Toledo, Ann Arbor & North Michigan. This first section is due east from Watervale along the southern shore of the Herring Lakes in Blaine Township to the town of Joyfield. The survey is being continued through Benzie County to Thompsonville, Mich., a distance of about 16 miles, but for the present it is not proposed to build beyond Joyfield. The construction work is under the management of Mr. Williams, and the work is being done by the employees of the Watervale Manufacturing Co.

GENERAL RAILROAD NEWS.

Atlantic & Danville.—The sale of this road at foreclosure at Danville, Va., was reported last week. The purchasers of the property, B. Newgass & Co., are the London firm representing the present bondholders. The purchase price was $1,105,000.

Baltimore & Lehigh.—The foreclosure of the first mortgage on the Maryland Central amounting to $850,000 has been ordered by the United States Court at Baltimore and C. R. Spence, of the Mercantile Trust & Deposit Co., trustee of the mortgage, has been appointed Commissioner to arrange for the foreclosure sale. The Maryland Central road is the Maryland portion of the Baltimore & Lehigh which was formed in 1891 by the consolidation of that road with the York & Peach Bottom. The line is now operated in two divisions with independent Receivers in Maryland and Pennsylvania. President William Gilmor has filed a billin the United States Courtat Baltimore for the removal of William H. Bosley, who is now Receiver for the Maryland portion of the road.

Centralia & Chester.—Articles of consolidation between the Centralia & Chester Railroad Company,

the Centralia & Altamont, and the Sparta & Ste. Genevieve under the above name were filed in Illinois last week. The line operated by the consolidated company will extend from the town of Altamont, in Effingham County, southwesterly through the counties of Effingham, Fayette and Marion to the city of Centralia; thence southwestwardly to the city of Sparta, and to a point on the Mississippi River nearly opposite to St. Genevieve, Mo., and also from the city of Sparta to the city of Chester.

The capital stock of the company is $1,680,000, and the principal office is to be at Centralia. The directors and officers of the present Centralia & Chester road continue for the consolidated company.

Columbus & Western.—The Farmers' Loan & Trust Co., of New York, has filed a bill in the United States District Court at Montgomery, Ala., to foreclose a mortgage covering the issue of $2,500,000 in bonds. The road extends from Columbus, Ga., to Birmingham, Ala. When the road was consolidated with the Savannah & Western consolidated mortgage bonds were issued to the amount of about $13.000,000. The Farmers' Loan & Trust Co. claim a prior lien on the property, under its mortgage. The bill asks for the appointment of a separate receiver or receivers for the Columbus & Western. Messrs. H. M. Comer and Robert J. Lowrey are receivers of the Savannah & Western under the bill filed by the Central Trust Co., of New York.

Delaware & Hudson Canal Co.—It appears that there has been a very decided difference of opinion among the members of the Board of Managers of the company in regard to the issue of stock to retire the seven per cent. bonds amounting to $4,829,000, which fall due this year. The directors have voted to issue the stock at par, but an influential minority in the Board has been in favor of issuing the stock at 75 per cent. The minority claims that the company's surplus now amounts to over $9,000,000, and that issuing the new stock at 75 would lessen the surplus only $1,250,000 the sale of the stock realizing $3,750,000. The question will be voted on by the stockholders at the annual meeting in May and both sides have issued calls for proxies, President Oliphant representing the conservative element and Vice-President Legrand B. Cannon being at the head of the minority of the Board.

East Tennessee, Virginia & Georgia.—Judge Burton, of the United States Court at Knoxville, entered a decree last week for the sale of the railroad in June. The suit for foreclosure was brought by the Central Trust Company, trustee, and the order of sale is preparatory to the reorganization of the company under the Richmond Terminal plan.

Farmville & Powhatan.—The city of Petersburgh, Va., holds a large interest in the Richmond, Petersburgh & Carolina road, or the Virginia & Carolina Railroad, as it is generally called, which is a partially graded railroad from Petersburgh, Va. Recently the Farmville & Powhatan Company submitted a proposition to purchase the city's interest in the roadbed, and to complete the line between Petersburgh and the North Carolina state line. The City Council is to discuss the offer at its meeting in May.

Findlay, Fort Wayne & Western.—The property of this company was sold at sheriff's sale at Ottawa, O., on April 7, by the Receiver, M. A. Smalley, and was purchased by C. N. Haskell, of Ottawa, acting for George Lord Day, of New York, one of the executors of the Astor estate. A new company called the Ohio Railroad has been organized as the successor of the present company. The incorporators of the new company are: Judge John H. Doyle, of Toledo; Charles T. Lewis, of Toledo; Harlan F. Burket, of Findlay; Charles M. Haskell, of Ottawa, and George Lord Day, of New York.

It is said to be the intention to complete the road on practically the old survey from a point about 12 miles south of Youngstown, O., to Fort Wayne, Ind. The road now in operation is 60 miles long from Findlay, west to the Ohio state line near Fort Wayne.

Illinois Central.—The following table gives the income from traffic for the eight months ending Feb. 28, as compared with the same period of 1893:

	1894.	1893.	Inc.
Miles operated	2,888	2,888	....
Gross earn	$15,054,985	$13.193,149	$1,861,836
Oper. expen. and taxes	10,093,822	9.621,139	472,683
Net earn	$4,961.133	$3,572,010	$1.389,153

The gross receipts from traffic for the month of March, 1894, are estimated at $1,484,287; the receipts for March, 1893, were $1,667,131; being an estimated decrease of $182,844.

Kentucky & Indiana Bridge Co.—The Louisville Trust Co., trustee of second mortgage, has filed in the Federal Court at Louisville a cross bill asking for a foreclosure sale. It is stated in the petition that on April 1, 1889, the company issued negotiable bonds for $600,000, with interest at five per cent. a year. Default was made in the payment of interest due October 1, 1893.

Kingston, Smith Falls & Ottawa.—Mr. C. F. Gildersleeve, President of this railroad, states that the construction work, which was begun at Kingston, Ont., last summer, has been continued through the winter, but the heavy rock cuts have prevented the work progressing with any degree of rapidity.

Marietta & North Georgia.—The foreclosure sale of this road, which has been advertised a number of times, has been postponed once more. It was to have taken place at Marietta on April 2, but Judge Newman, of the United States Circuit Court, postponed the sale until May 8 at the request of the attorneys of the Central Trust Co., of New York. He stated that there would be no further postponement of the sale beyond that date.

The attempt of the Central Trust Co., of New York, to secure the removal of J. B. Glover as Receiver of the property, and the appointment in his stead of Elias Summerfield, of Kansas City, has been renewed in the United States Circuit Court at Atlanta. The petition claims that the company needs immediately several hundred thousand dollars for Receiver's certificates and other claims which the Receiver cannot pay, and that an arrangement has been made with the Reorganization Committee of the company to advance the funds necessary to pay off these claims, providing an order is made removing Mr. Glover from the receivership.

Mount Washington.—At a special meeting of the directors this week it was voted to purchase the interest of Col. E. S. Pingree, in Mount Washington, for $156,000, and to increase the capital stock by that amount. It was also voted to buy the Summit House and other property owned by the Concord & Montreal Railroad, and the Walter Aiken estate, for $26,000, and to pay for the same in stock at par. J. H. Pierson, of Concord, was elected President, vice Walter Aiken, deceased.

North Galveston, Houston & Kansas City.—The postponed foreclosure sale of this road is to be held at Galveston, Tex., on May 1. The sale will be under the order of the District Court of Galveston County which was made on Jan. 27 last, in the suit against the Minneapolis Trust Co. The sale will include the road between Virginia Point and North Galveston, Tex., 35 miles, and all the property of the company.

Palisades.—David A. Pell, of Hackensack, N. J., has been appointed Receiver of the Fort Lee or Palisades Railroad by Chancellor McGill, of New Jersey. The road is to extend from Fort Lee, N. J., along the Palisades, and it is in course of construction. The purpose of the receivership is said to be to facilitate reorganization.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The summary of the annual report published in the newspapers gives the following figures: The gross earnings on the main line were $15,750,806; operating expenses, $12,034,631. The total net revenue for 1893 was $3,730,224, a decrease, as compared with 1892, of $182,380. The net profit for 1893 was $1,087,612. In 1893 the company paid a dividend of four per cent. on its preferred stock. The total tonnage moved in 1893 was 16,049,777 tons, as against 17,246,189 in 1892. The passenger traffic shows a gain of $741,474, as compared with 1892.

Quaker City Elevated.—The injunction suits preventing this company from building its proposed elevated structure through the city of Philadelphia were argued before the Pennsylvania Supreme Court, at Philadelphia, last week. The suits rest upon the construction put upon the Pennsylvania general railroad act of 1868, under which the company is incorporated. The property owners who have secured these injunctions claim that that act provides only for the incorporation of steam railroad companies, and that the elevated company is a street passenger railroad which, by the general railroad act, is especially prohibited from incorporation under the terms of that law and that its charter is not valid. The principal argument for the company was made by J. C. Carter, of New York, who claimed that the elevated railroad was a steam railroad, within the term of the general railroad act; that its charter under that law was legal and gave it the authority to construct a road through the city streets, as proposed, when the consent of the city Council had been obtained, and this had been done.

Sedalia, Warsaw & Southwestern.—The annual meeting last week resulted in the re-election of the old directors representing the present management of the Missouri Pacific. An attempt was made by Dwight Treadway and C. S. Greeley, of St. Louis, minority stockholders, controlling about one-third of the capital stock, to enjoin the Missouri Pacific representatives from voting their stock, on the ground that as the Versailles branch of the Missouri Pacific is a parallel line of this road and therefore the control of this road by the Missouri Pacific is illegal. The county court, however, refused to issue the injunction. Mr. Treadway last fall applied for a Receiver of theroad and for its operation independent of the Missouri Pacific, but the suit has not been decided. Mr. Treadway has organized a company to build a road from Springfield to Sedalia, and he expects to include the 43 miles of this road between Sedalia and Warsaw as part of this line.

St. Clair County Belt.—The St. Clair County Coal Railroad Company, of Illinois, has filed a notice of the change of name to the St. Clair County Belt Railroad Company. Notice has also been given of an increase of capital stock from $100,000 to $500,000 and of an issue of bonds to the amount of $500,000.

Tacoma, Lake Park & Columbia River.—Foreclosure proceedings have been begun in the United States Circuit Court at Tacoma against this company, which now operates a 12-mile line between Tacoma and Lake Park, Wash.

TRAFFIC.

Traffic Notes.

Louisville dispatches report that President M. H. Smith, of the Louisville & Nashville, has issued a pamphlet of 11 pages replying to some of the statements in Mr. Felton's circular issued in the recent controversy. Additional facts are given concerning various kinds of traffic. It is alleged that two or three dealers controlled the movement of corn southward through Louisville, selling it at one or two cents a bushel less than any one else could afford to sell.

The reductions in pig iron rates by Southern roads, going into effect April 2, are an important factor in the iron market. Fifty cents a ton to Ohio River points and as high as 85c. to some points in the central West represent the size of the concession, which enables Southern producers to enter upon a vigorous compaign in business from the territory from which they have been wellnigh barred for several weeks. To Cleveland the new rate is $3 from Birmingham, Ala., as against $3.85 formerly.—*Iron Trade Review.*

The settlement of the westbound Trunk Line passenger rate war seems to require a good deal of time. Vice-President John B. Garrett, of the Lehigh Valley, is quoted as admitting very freely in an interview that his company had sold large numbers of tickets to brokers, with the knowledge that they would be disposed of at very low rates, and that the company intended to force the fighting in a radical manner. The reporters gather that the outstanding tickets of the Lehigh Valley cannot be cleared out of the market unless the other trunk lines buy them up, and the traffic officers of the Lehigh Valley are represented as strenuous in their demand for 10 per cent. of the westbound passenger business from New York, instead of 3 per cent., which is their present allotment.

Chicago Traffic Matters.

CHICAGO, April 11, 1894.

Notwithstanding the favorable outlook last week no settlement was reached between the Union Pacific and the Western Passenger Association in regard to westbound immigrant traffic. A proposition was made the Union Pacific to take 10 per cent. more of the business than allowed the other Western lines, which was rejected. A counter-proposition was made which is understood to have been a demand for one-half the entire immigrant business which, in turn, was rejected by the Advisory Committee. It is evident that the Union Pacific is relying upon arrangements, which it is said to have made, which will give it 80 per cent of all the business unless met by the other lines, to force the association roads to guarantee it a much larger percentage than any of them are willing to concede. Chairman Caldwell has gone East to take steps in the interest of the parties to the agreement to meet the competition of the Union Pacific. This is evidence that all hope of an amicable arrangement has been abandoned and that open hostilities will be commenced against the Union Pacific.

Eastbound freight rates are apparently being fairly well maintained pending the adoption of the division of traffic agreement which it is expected will go into effect this month.

Eastbound passenger matters are also unusually quiet this week, but it may be only the calm before the storm. The new $10,000 penalty contract clause of the agreement is not yet ready for signatures, and until it is none of the roads are anxious to show their hands. I think, however, when it is in shape that it will be fouud that those roads that have emigrant contracts with the steamship lines will not only refuse to execute the contract, but will flatly decline to cancel the emigrant contracts, even if, as was suggested at the New York meeting, the other roads "chip in" and help pay for the breaking of the contracts. No action was taken touching this matter at the meeting of the passenger department of the Central Traffic Association last week, the entire subject being in the hands of the joint committee.

The arbitrators in the appeal of the Burlington from a fine of $350, imposed by the local passenger association for the purchase of six tickets of Burlington issue from a scalper at reduced rates, have reversed the finding of the association. The Burlington officers swore that the road had had no dealings with the scalper, that no commissions had been or would be paid on the tickets in question and that the tickets had been bought at tariff rates. On this showing the arbitrators (Messrs Buchanan, Charlton and Cooke), were of course forced to acquit on the ground of "not proved." Now the other roads are trying to make up their minds just where the scalper reimbursed himself for the $8 cut on the batch.

The jury in the suit of Swift & Co. vs. the Chicago & Grand Trunk to recover overcharges disagreed after being out 30 hours, and were discharged. The claim was for over $800,000, covering alleged overcharges on dressed beef shipments extending over a period of four years. The plaintiffs claim that they were charged 65 cents per 100 lbs., whereas 45 cents would have been a sufficient rate, for the reason that in 1887 they entered into a contract with the Canadian Pacific and Wabash to carry their meat at the latter rate. The defendants set up that the Canadian Pacific, being largely subsidized by the Canadian Government could afford to carry freight cheaper than they (the Grand Trunk) could, and that if they (the Grand Trunk) had decreased their rate on dressed beef they would have been obliged to raise the rates on other commodities. Five similar suits against the same road brought by other packers are now pending in the Circuit Court.

Considerable dissatisfaction is expressed by the other lines at the action of the Alton in making a rate of one fare for the Denver meeting of the American Institute of Homeopathy, the Young People's Society of Christian Endeavor in Cleveland and the Baptist Young People's Society of America in Toronto, on the ground of outside competition. The other lines fear that these rates will establish a precedent which will compel them to make one-way rates for all the prominent conventions this season.

A report was telegraphed from Kansas City that the Santa Fe had made a cut in grain rates from Kansas to Texas points. The Santa Fe officials deny this, stating that they only met an open tariff of the Missouri Pacific to certain Texas points competitive with the Santa Fe.

It is announced that the Illinois Railroad and Warehouse Commissioners are to consider the matter of discrimination against Chicago from outside jobbing points or interior Illinois points.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending April 7 amounted to 91,975 tons, against 95,188 tons during the preceding week, an increase of 9,213 tons, and against 70,370 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Apr. 7.		W'k to Mar.31.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	8,651	9.4	9,286	9.7
Wabash	10,376	11.3	8,946	9.4
Lake Shore & Michigan South.	14,770	15.9	15,631	16.4
Pitts., Ft. Wayne & Chicago	11,463	12.5	15,636	16.5
Pitts., Cin., Chicago & St. Louis	12,796	13.9	9,106	9.6
Baltimore & Ohio	8,388	9.1	8,690	9.1
Chicago & Grand Trunk	6,780	7.4	6,267	6.6
New York, Chic. & St. Louis	10,015	10.9	9,004	9.5
Chicago & Erie	7,390	8.1	10,098	10.6
C., C., C. & St. Louis	1,316	1.5	2,464	2.6
Totals	91,975	100.0	95,188	100.0

Of the above shipments 15.629 tons were flour, 43,598 tons grain and millstuff, 11,582 tons cured meats, 11,745 tons dressed beef, 1,152 tons butter, 1,443 tons hides and 4 855 tons lumber. The three Vanderbilt lines carried 36.2 per cent., the two Pennsylvania lines 26.4 per cent. Lake lines carried 107,610 tons grain.

(Other Chicago traffic news will be found on page 271).

Enforcing Penalties for Breaking Agreements.

The *Journal of Commerce* (New York), speaking of the ten thousand dollar item in the proposed trunk line agreement, has the following to say:

As we are informed, each of the companies signing will deposit $10,000 as "unliquidated damages" with the Commissioner. But suppose that the managers of one of the lines should disregard this agreement, what would be the result? The fine would be imposed by turning the $10,000 deposited into the common fund. The penalty would have to be submitted to, and judgment confessed, or legal proceedings would have to be instituted for the recovery of the money. These could be brought only on one of two grounds, either that the discrimination of which the road was found guilty by too presumably impartial commissioners did not exist, or that the allied associatons had no legal right to enforce the penalty. In the one case there would be a full and judicial inquiry into the facts; to the manifest advantage of honest railroad management and the corresponding discouragement of trickery and evasion. In the other, there would be a virtual confession by the accused company that it had been caught in a breach of the law, no less than of its own agreement, but that it did not propose to let a trifle like that stand between it and the recovery of $10,000. Would the security holders of such a railroad be likely to regard this kind of management as a benefit to their property? Could the President of such a railroad be deemed fit to hold any other position of trust and responsibility?